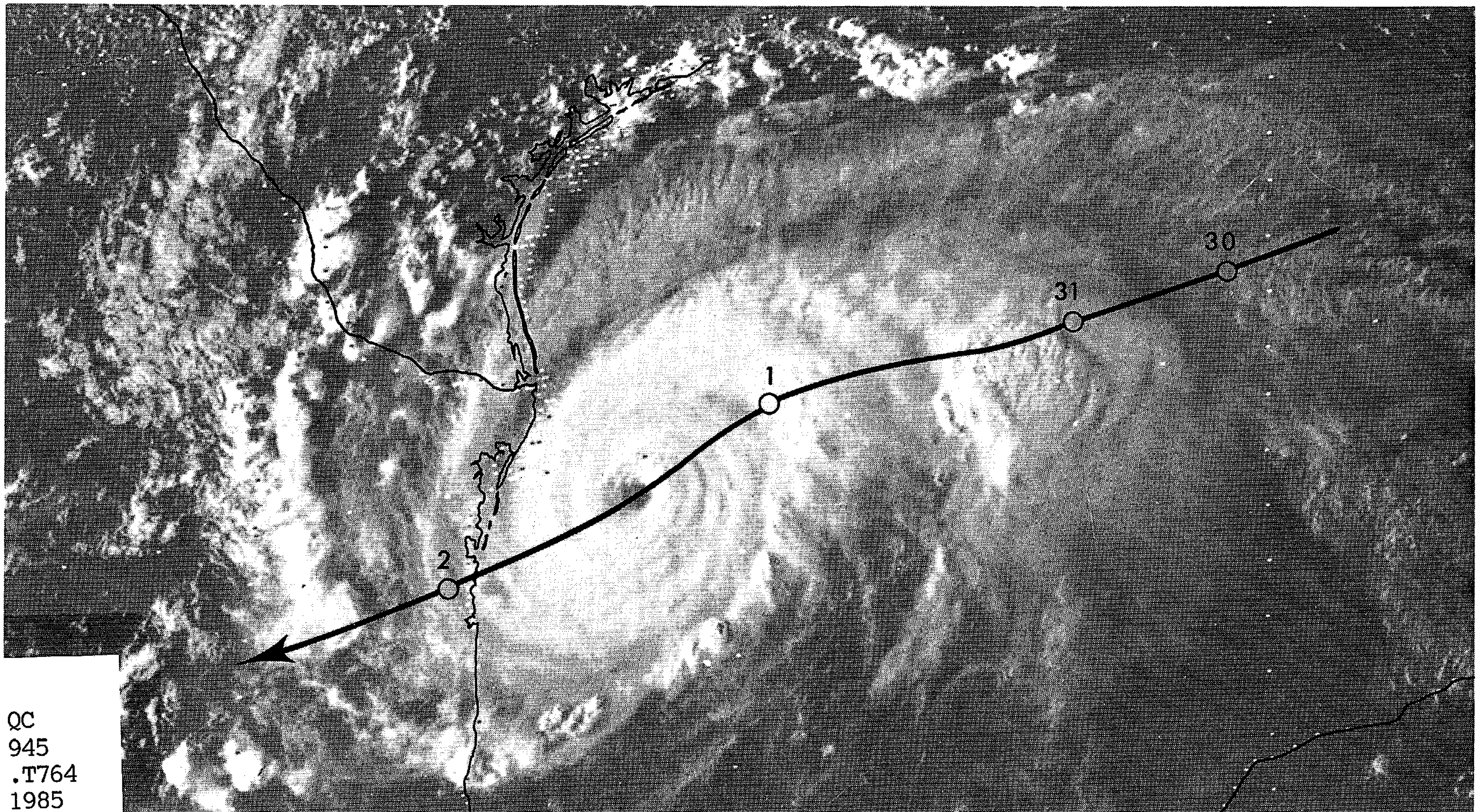
Tropical Cyclones of the North Atlantic Ocean, 1871-1980

(With Storm Track Maps Updated Through 1984)



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Cover illustration—NOAA weather satellite photograph (GOES-2, visible sector) of hurricane Anita located over the western Gulf of Mexico, 2300GMT (5 P.M. Central Standard Time) September 1, 1977, and moving toward the southwest at 9 knots. The "eye" of the storm is located at the center of the white rotating cloud mass, approximately 95 nautical miles southeast of Brownsville, Texas. Hurricane later crossed Mexican coast, 125 nautical miles south of Brownsville with sustained winds of 150 knots. Heavy line shows storm track between August 30 and September 2 with the 1200GMT positions of storm center shown by open circles. The approximate scale is one inch equals 95 nautical miles. (Photograph courtesy Miami Field Station, NOAA National Earth Satellite Service.)

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Tropical Cyclones of the North Atlantic Ocean, 1871–1980

(With Storm Track Maps Updated Through 1984)

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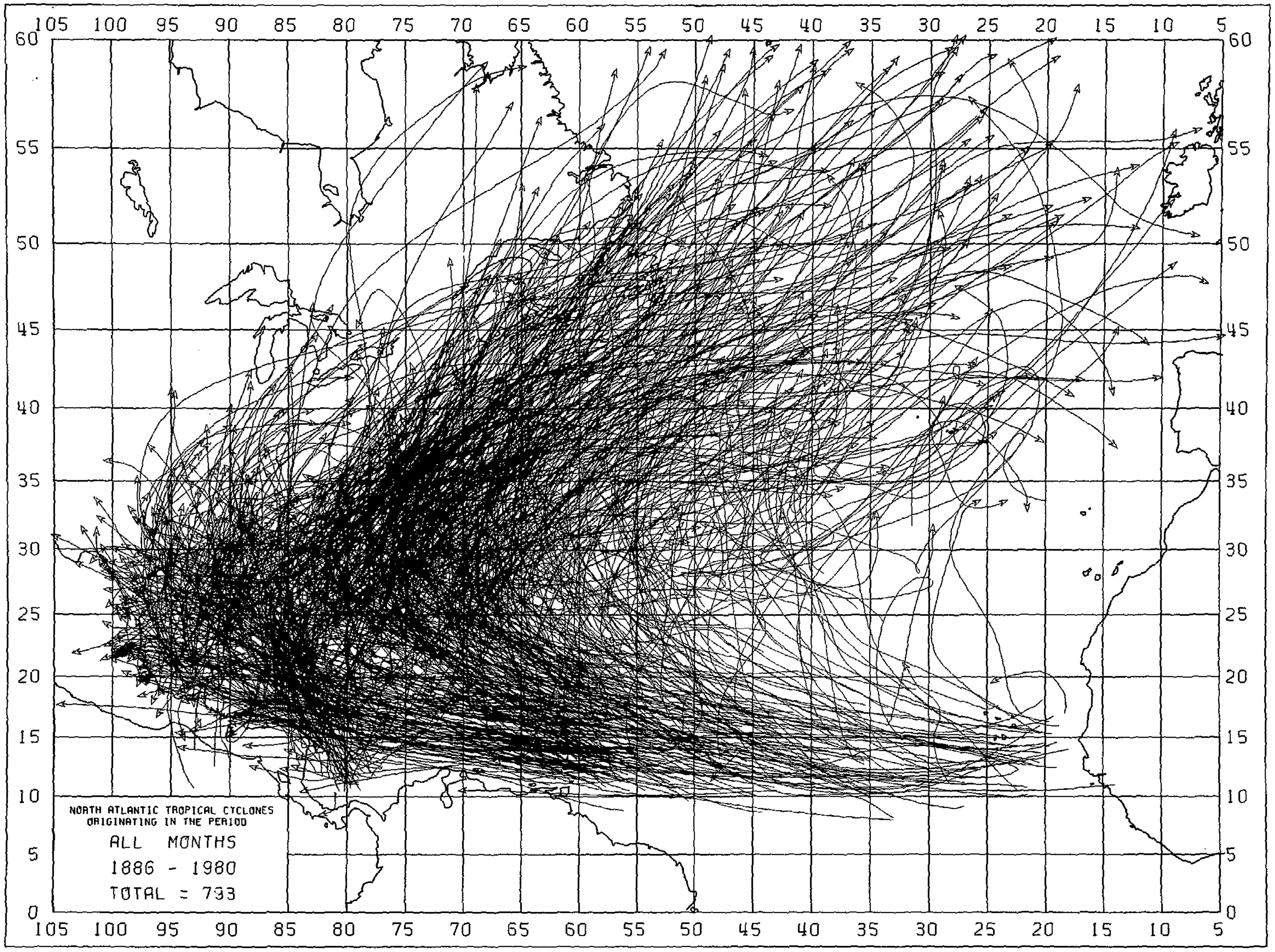

Figure 1.—Computer plot showing the tracks of the 793 known Atlantic tropical cyclones reaching at least tropical storm intensity (see section 4.1) over the 95-year period 1886 through 1980.

Tropical Cyclones of the North Atlantic Ocean, 1871 – 1980

1. INTRODUCTION

Over the 110-year period 1871 through 1980 a total of 882 tropical cyclones (tropical storms and hurricanes) of various intensities have been recorded over the North Atlantic area. The formation of these storms and possible intensification into mature hurricanes take place over warm tropical and subtropical waters. Eventual dissipation or modification, averaging a week to 10 days later, typically occurs over the colder waters of the North Atlantic, or when the storms move over North America and away from the sustaining marine environment.

The geographical areas influenced by tropical cyclones are often referred to as *tropical cyclone basins*. Figure 1 shows the areal extent of the *Atlantic tropical cyclone basin*; it includes much of the North Atlantic Ocean, the Caribbean Sea, the Gulf of Mexico, and a substantial portion of the adjacent coastal area. The Atlantic tropical cyclone basin is but one of six in the world; others in the Northern Hemisphere are the western North Pacific, the eastern North Pacific and the northern Indian Ocean. The Southern Hemisphere basins are the southern Indian Ocean and the southwest Pacific-Australian area. Two large tropical ocean areas are devoid of tropical cyclone occurrence—the South Atlantic and the eastern portion of the South Pacific. Tropical cyclones usually are restricted to single basins, although in rare instances, storms have moved between adjacent basins in the same hemisphere.

Because of the potential destructive powers of tropical cyclones, interest in them has always been great. Numerous publications are available which describe tropical cyclone activity over the various basins. A major work in 1974 by Crutcher and Quayle (21), contains charts and diagrams showing storm frequency and motion characteristics over the six basins. Gray (35, 36, 37) presents an instructive and more theoretical treatment of global tropical cyclone climatology, including a discussion of the meteorological conditions associated with tropical cyclone development. Studies on individual basins are part of the global-scale climatologies.

Tropical cyclone climatologies are based upon the analysis of many years of individual tropical cyclones, approximately 82 of which occur annually over the globe (21). Today, computers perform much of the previously tedious analysis. Figure 1, for example, would have been extremely difficult to produce without the aid of a computer. Examples of the utility of computers in tropical cyclone climatology are given by Hope and Neumann (49, 50) and Neumann and Hill (69).

Tropical cyclones have always been of concern to mariners and are reasonably well documented over remote oceanic areas, even back to the previous century or earlier. Ludlum (59), for example, presents a history of Atlantic tropical cyclones back to the time of Columbus.

The responsibility for collation and dissemination of tropical cyclone tracks is not clearly defined, but generally rests with the meteorological services within the various basins. In the United States, the principal publisher of annual articles describing a previous year's North Atlantic (and Eastern Pacific) tropical cyclone activity is the *Monthly Weather Review* (39, 57).

For the Atlantic basin, tropical cyclone tracks have been published at irregular intervals. U.S. Weather Bureau Technical Paper Number 36 (22) provided tracks and certain statistical summaries for 1886 through 1958. Five years later, Cry, in Weather Bureau Technical Paper Number 55 (23), extended the tracks backward through 1871 and forward through 1963, and extended the statistical analysis. For a number of years, this paper was a standard reference to Atlantic tropical cyclone activity. It provided the nucleus for this publication and revision which extends the tracks through the 1980 season.

2. SCOPE

This paper presents North Atlantic tropical cyclone tracks and certain basic statistical summaries. A detailed analysis of the tracks was not attempted. This is a departure from Cry (23) who includes a considerable amount of track analysis and interpretation. The omission of some of the material kept the size of the revision from becoming excessive. Several other recent publications also deal specifically with the analysis of Atlantic tropical cyclone tracks. These include NOAA publications prepared for the Federal Flood Insurance Program and the U.S. Army Corps of Engineers (47, 71, 72) and studies to satisfy the needs of the National Hurricane Center (42, 48, 85). The National Climatic Center also has been active in work on tropical cyclone activity to satisfy the operational needs of the U.S. Navy (18, 19, 20, 21).

Despite the availability of studies dealing with the climatology of tropical cyclones, many of the hundreds of requests for information received annually by the National Climatic Center and the National Hurricane Center still require additional work tailored to specific user requirements. The availability of storm tracks for the complete 110-year period 1871–1980 should satisfy many of these requests.

Since the study will be used primarily as a reference volume, users probably will limit reading of any textual material to sections pertinent to their particular query. For this reason, a certain amount of redundancy between sections was necessary.

3. CHARACTERISTICS OF TROPICAL CYCLONES

It is beyond the scope of this study to discuss details of the characteristics of tropical cyclones. Some comments are necessary, however, for proper interpretation of the material presented. The reader is referred to Miller (63) for more detailed information on the characteristics of tropical cyclones. Texts by Riehl (78) and Palmén and Newton (73) also devote chapters to tropical cyclones. The comprehensive study by Dunn and Miller (26) contains discussions on virtually all aspects of Atlantic tropical cyclones. Certain specialized topics, such as the state-of-the-art of forecasting tropical cyclone motion and the meteorological criteria concerning the initial deepening of tropical cyclones, are discussed by Simpson (87) and Hebert (45), respectively.

Any closed circulation in which the winds rotate counter-clockwise in the Northern Hemisphere or clockwise in the Southern Hemisphere is called a cyclone. The term "tropical cyclone" refers to such a circulation which develops over tropical waters. Landsberg (53) pointed out that these storms may be a major factor in maintaining the atmospheric heat and moisture balance between the tropics and the poleward latitudes; they may be thought of as providing a kind of "safety-valve" that limits the continued buildup of heat and energy in tropical regions.

Cyclones which form outside the tropics (extratropical cyclones) have structure, energetics and appearance (when viewed from weather satellites or radar) that are different from tropical cyclones. They derive their energy primarily from contrasts of temperature and moisture and are typically associated with cold and warm fronts. Tropical cyclones, with energy derived from the latent heat of condensation of water vapor, are generally smaller in extent than extratropical cyclones and typically range from 100 to 600 nautical miles in diameter at maturity. Winds normally increase toward the center of tropical cyclones with sustained speeds often exceeding 100 knots near the center. Occasionally, sustained winds exceeding 150 knots, with still higher gusts, may occur in well-developed systems. Apart from the wind, other destructive features of tropical cyclones include torrential rains over a large area and coastal storm tides of 10 to 25 feet above normal in extreme cases. Indeed, coastal inundation from the storm surge is primarily responsible for deaths and damages from these storms in the United States.

A unique feature of tropical cyclones is the central "eye." The pattern of winds does not converge to a single point, but becomes tangent to the eye wall (boundary updraft column) at a radius of about five to 15 miles or more from the geometric center. The eye is generally an area of light winds, minimum cloud cover, and minimum sea-level pressure; it provides a convenient frame of reference that can be tracked with the aid of aircraft, satellites or radar. In the cover photograph, for example, the eye is clearly identifiable in the center of the rotating cloud mass southeast of Brownsville, Tex.

The tropical cyclone tracks presented here are technically referred to as "best-tracks." They represent the best estimate of the *smoothed* path of the eye as it moves across the earth's surface. Smoothing is necessary to remove small-scale oscillatory motions of the storm center, about five to 20 nautical miles about a mean path. These smaller scale motions are transitory and are not representative of the more conservative motion of the entire storm envelope. Radar verification of eye oscillations was obtained as Hurricane Carla (1961) traversed the Gulf of Mexico (114). Recent satellite evidence of similar motions of the eye of Hurricane Belle (1976) is given by Lawrence and Mayfield (56). The storm tracks in Chart Series A and B should be considered as the average path of the larger scale storm circulation system and not necessarily the precise location of the eye at any given time.

4. CLASSIFICATION OF ATLANTIC TROPICAL CYCLONES

In the course of their life cycle, tropical cyclones, like other atmospheric circulation systems, pass through stages of development, intensification, maturity, and decay or modification. Satellite imagery has confirmed that some North Atlantic tropical cyclones classically develop from tropical waves which regularly move off the coast of Africa near 15° N latitude. The relationship between these waves and Atlantic tropical cyclones has been studied by a number of authors. Carlson (13), for example, presents case histories, while Shapiro (82) discusses theoretical aspects of the transformation of certain waves into tropical cyclones. Beginning with the 1967 Atlantic hurricane season, Simpson, et al. (84) initiated a formal annual "census" of African disturbances, intertropical convergence zone disturbances (2), and other features upon which Atlantic tropical cyclones are known to develop. In 1977, Frank and Clark (32) summarized this annual tabulation over a 10-year period.

Weather satellites also have confirmed that some tropical cyclones may develop in connection with old polar troughs or upper-level cold lows and have initial cold-core circulations. In recent years, these latter systems have been designated as *subtropical* cyclones during the period they exhibit cold-core characteristics. The subject is discussed by Hebert (41). Finally, many tropical cyclones, after moving out of the tropical environment, may lose their tropical characteristics and become *extratropical.* While the primary purpose of this paper is to discuss tropical cyclones, it is necessary, for continuity, to discuss subtropical and extratropical cyclones as well.

4.1 Tropical Cyclones

Tropical cyclones are technically defined (100) as nonfrontal low pressure synoptic-scale [2] systems that develop over tropical or subtropical waters and have definite organized circulation. Further classification depends upon the wind speed near the center of the system. The terms *tropical depression, tropical storm,* or *hurricane* are assigned depending upon whether the sustained surface winds near the center of the system

[2] Synoptic-scale refers to large-scale weather systems as distinguished from local systems, such as thunderstorms.

are, respectively, $\leq$ 33 knots, 34 to 63 knots inclusive, or $\geq$ 64 knots. More complete definitions are given in table 1. Tropical cyclones are not archived (or named) unless they reach at least tropical storm strength. The material presented herein concerns only the storms that met this requirement.

The term *sustained wind* refers to the wind averaged over one minute. Shorter period gusts (or lulls) in the wind may be considerably higher (or lower) than the sustained wind. Dunn and Miller (26), page 65, illustrate gustiness. The wind criteria defining the various stages of tropical cyclones are rather rigidly defined, but the opportunity to measure the wind with a precision implied by the definitions seldom exists. The maximum wind speed often must be inferred from indirect evidence, and a figure is subjectively assigned by the responsible analyst after considering all available information. These operational constraints should be considered before making decisions based on intensity criteria given in Chart Series A and elsewhere.

4.2 Extratropical Cyclones

During the latter stages of their life cycle, tropical cyclones are often classified as *extratropical.* The extratropical stages of the cyclone tracks shown in this study indicate that modification of the tropical circulation was started by movement of the cyclone into a nontropical environment. In this situation, the size of the circulation usually expands, the speed of the maximum wind decreases, and the distribution of winds, rainfall, and temperatures around the center of the cyclone become increasingly asymmetric. While these characteristic features develop, some tropical features, such as a small area of strong, often hurricane-force, winds near the center, the remnants of an eye, and extremely heavy rainfall, may be retained for a considerable time. The 1938 New England storm (storm number 4), described physically by Pierce (75) and in narrative form by Allen (5), is a good example of a storm which was technically classified as extratropical, but which still maintained hurricane-like characteristics.

There are no wind speed criteria associated with the term *extratropical.* Usually, wind speeds near the center of a storm gradually subside. In some cases, however, reintensification of the system may occur when mechanisms conducive to extratropical development offset the loss of the tropical energy source. If over land, these mechanisms may offset the dissipative effects of the increase in surface friction (62).

4.3 Subtropical Cyclones

Until the late 1960's, the terms *tropical* and *extratropical,* as described in sections 4.1 and 4.2, were used to categorize the life cycle of hurricanes. Although it was often suspected that a given storm was "hybrid" in that it exhibited both tropical and extratropical characteristics, the lack of sufficient observational evidence or official sanction precluded the use of other terminology. The problem occasionally led to some storms being unnamed. Spiegler (88) and Ferguson (30) give further background information.

Table 1.—*Classification Criteria for Tropical, Subtropical, and Extratropical Cyclones, 1899–1980.*

Stage of development	Years used	Criteria
Tropical depression (development)	1951–1980	The formative stages of a tropical cyclone in which the maximum sustained (1-min mean) surface wind is $\leq$ 33 kt.
Tropical storm	1899–1980	A warm-core tropical cyclone in which the maximum sustained surface wind (1-min mean) ranges from 34 to 63 kt.
Hurricane	1899–1980	A warm-core tropical cyclone in which the maximum sustained surface wind (1-min mean) is $\geq$ 64 kt.
Tropical depression (dissipation)	1899–1980	The decaying stages of a tropical cyclone in which the maximum sustained surface wind (1-min mean) has dropped to $\leq$ 33 kt.
Extratropical cyclone	1899–1980	Tropical cyclones modified by interaction with nontropical environment. No wind speed criteria. May exceed hurricane force.
Subtropical depression	1968–1980	A subtropical cyclone in which the maximum sustained surface wind (1-min mean) is $\leq$ 33 kt.
Subtropical storm	1968–1980	A subtropical cyclone in which the maximum sustained surface wind (1-min mean) is $\geq$ 34 kt.

By 1968, the availability of continuous daylight satellite imagery and other observational evidence confirmed the existence of an intermediate class of storms with both tropical (warm-core) and extratropical (cold-core) characteristics. The *Monthly Weather Review's* annual summary articles (107), which describe the 1970 and 1971 hurricane seasons, call attention to this type of storm and the lack of suitable descriptive terminology. Additional studies by Simpson (86) and Spiegler (89) focus attention on the nomenclature problem.

Beginning in 1972, the term *subtropical* was adopted as official terminology, and the annual summary article appearing in the *Monthly Weather Review* for that year includes the tracks of the subtropical stages, if any, of tropical systems. Satellite imagery and other observational evidence enabled Hebert and Poteat (43) to reexamine the official Atlantic tracks for the 1968, 1969, 1970, and 1971 seasons and to identify subtropical portions of the cyclones for those years. The reevaluation included the addition of the storms suggested by Spiegler (88).

Subtropical cyclones are defined (100) as nonfrontal low pressure systems comprising initially baroclinic (cold-core) circulations developing over subtropical waters. Many of these eventually develop into purely tropical (warm-core) systems, but others remain as subtropical. On rare occasions, such as storm number 8, 1973, subtropical systems have evolved from tropical systems.

Depending upon wind speed, two classes of subtropical cyclones are recognized—*subtropical depressions* and *subtropical storms*. The former have maximum sustained winds of $\leq$ 33 knots and the latter, $\geq$ 34 knots. More complete definitions are given in table 1. There is no upper wind speed limit associated with subtropical storms as there is with tropical storms. However, experience has shown that when and if surface winds in subtropical storms do reach or exceed 64 knots, the system typically takes on sufficient tropical characteristics to be formally designated as a hurricane (see, for example, storm 3, 1972). In rare cases, such systems do associate themselves with hurricane force winds without attaining sufficient tropical characteristics. In this case, the term *subtropical storm* is retained. An example of such an occurrence is storm 6, 1968, which contained hurricane force winds on September 20 and 21. Since this storm would probably, in earlier years, have been designated as a hurricane, it is tabulated as such in summary tables and figures.

4.4 Summary of Classification Criteria

A summary of the various storm classification criteria and the years over which each is applicable are given in table 1. The criteria are valid only for the years beginning with 1899. For 1886 through 1898, available data are too fragmented, and the tracks are presented as being entirely tropical storms or hurricanes, depending upon the maximum intensity apparently attained by the storm at some point along its track. Storm number 7, 1898, for example, was known to be a hurricane (15) when it moved into Georgia on October 2. However, the hurricane designation does not necessarily apply elsewhere along the track. For still earlier years, 1871 through 1885, the data are even more uncertain, and it was impossible to indicate other than a tropical cyclone of unknown intensity.

The lack of specific intensity documentation before 1899 should not be interpreted as a complete lack of information on these early storms. Indeed, portions of many of these tracks were well documented if they were associated with disasters to populated areas or shipping. For example, the hurricane of August, 1873, which destroyed 1,223 vessels, and the hurricane of August, 1893 (storm number 6), which inundated the islands off the coasts of Georgia and South Carolina with large losses of life and property, are described by Garriott (33) and others. Persons seeking specific information on these, and on storms occurring in later years, should consult the references given in section 10.

5. DATA SOURCES

For 1871 through 1963, the primary reference for the storm tracks and associated intensity criteria was U.S. Weather Bureau Technical Paper Number 55 (23). Although the main purpose of the present revision was to extend the track charts through the 1980 season, a few of the original tracks were modified, based on additional information available to the National Hurricane Center. Specific details on these modifications are given later in this section. Considering the widespread use of the above cited paper over the many years since its publication, the requirement for only a few changes attests to the care that went into its preparation. Beginning with the following paragraph, the original discussion on sources of data from Technical Paper Number 55 is quoted.

5.1 Data Sources, 1871–1963

"The history of hurricanes extends back to the early voyages of discovery in the late fifteenth century. These early records are fragmentary and incomplete. One of the earliest compilations of hurricane tracks (1804–1853) was prepared by Redfield (77). Millas (61) has recently attempted to document many of the early storms. Ludlum (59) has also recently prepared a hurricane chronology extending through 1870.

"Information from many sources has been used to define the tracks of the tropical cyclones presented in this paper. U.S. Weather Bureau Technical Paper No. 36 (22) provided the nucleus. The primary continuing reference, the *Monthly Weather Review* (105), first appeared in June 1872 and has been published without interruption to the present, although changes in format, emphasis, and content have been numerous. Monthly reports on North Atlantic tropical cyclone activity and tracks have been included in most volumes and, since 1922, annual summary articles have also appeared in most years. Numerous papers discussing various aspects of tropical cyclones or complete details of specific storms, have been published in the *Review* throughout the years. Summaries of each tropical cyclone season since 1950 have also been included in *Climatological Data National Summary* (103); details of hurricanes affecting the United States are given there and in appropriate monthly issues of *Climatological Data* for individual States (104).

"The first comprehensive climatological analyses of the early series of Signal Service synoptic weather maps were made between 1874 and 1889 by Professor Elias Loomis of Yale. Of his many papers (58), one was devoted to North Atlantic tropical cyclone activity during the years 1871 through 1880.

"Several summaries containing complete series of tropical cyclone tracks and information on various storm features have been published periodically since the turn of the century. In preparing this paper, we have relied heavily on the works of Garriott (33), which contain tracks for the years 1878–1900; Fassig (29), 1876–1911; Mitchell (64, 65), 1887–1932; Cline (16), 1900–1924 and Tannehill (94), 1901–1955. Additional unpublished chronologies of tropical cyclone tracks have been available, including the charts and notes of Tingley (96) for 1871–1930; charts probably prepared by Mitchell (66) 1898–1920; and track charts centered on the Gulf of Mexico prepared at the U.S. Weather Bureau Office, New Orleans, Louisiana (110), 1875–1956.

"In addition to these primary sources containing relatively long series of tracks, the following less extensive sources have also been used: Alexander (4); Bonnelly (7); Bowie (9); Contreras Arias (17); Deutsche Seewarte (24); Elwar (28); Fischer (31); Gray (34); Hall (40); Newnham (70); Salivia (80); Sarasola (81); Tannehill (92); and Viñes (115). The recent comprehensive book by Dunn and Miller (26) contains complete discussions of various aspects of tropical cyclones, including a continuation of Tannehill's chronology."

5.2 Additional Data Sources 1871–1963

The foregoing summary of data sources, 1871–1963, was quoted directly from Technical Paper Number 55 (23). No formal attempt was made to review and revise the original tracks. Indeed, considering the exhaustive list of references in (23), and the lack of any significant new material, such a review could have been counter-productive.

In connection with its research and operational commitments, the National Hurricane Center (NHC) maintains and continuously updates detailed computer files of Atlantic tropical cyclone tracks back to 1886. An analog forecast technique, HURRAN (48) (HURRicane ANalogs), for example, is based on these data. Initially, the computer files were developed from data presented in Technical Paper Number 36 (22). However, they have been gradually updated over the years and currently contain storm positions, sustained wind speeds and measured surface pressures (when available) at 6-hourly intervals beginning with 1886. Only a few differences exist between the NHC positions and those given by Cry in (23). These are:

1) The track of storm 2, 1929, was adjusted to pass over Andros Island in accordance with the findings of Sugg, et al. (91);
2) The 7 p.m. EST, November 4 position of storm number 6, 1935, was moved southwestward along the original track to agree with

original surface observations on file at the National Weather Service Forecast Office, Miami;

3) An additional storm was added for the year 1945 (storm number 11) in accordance with a study by Fernandez-Partegas (74);
4) The hurricane stages of storm number 4, 1928, storm number 11, 1944, and storm number 2, 1904, were extended farther northward to agree with a study by Hebert and Taylor (42);
5) The status of storm number 3, 1903, was downgraded to tropical storm before the storm entered the Gulf of Mexico, to agree with studies by the National Weather Service Hydrometeorological Branch and as implied in the *Monthly Weather Review* for September 1903;
6) The track of storm number 1, 1876, was made to pass through Washington, D.C., to agree with material appearing in the *Monthly Weather Review* for September 1876.
7) To be consistent with current operational practice, the hurricane stage of storm 4, 1938, was extended northward.
8) In accordance with published and unpublished data on file at NHC, the tracks and intensities of storms 2 and 19, 1933, and storm 3, 1951, were modified.
9) Several additional changes were made in the 1981 revision. These are: (a) the track of storm number 4, 1877, passing south of Curacao to agree with data on file at the Netherlands Antilles Meteorological Service; and (b) minor editorial corrections to storm track maps for the years 1933, 1960, 1961, 1966, 1971, and 1975.

Several additional minor differences exist between the NHC master data tape and Cry's (23) tracks. For example, detailed records on file at the NHC indicate that the exact 7 a.m. September 18 position of storm number 6, 1926, was 25.6°N, 80.3°W, rather than 25.8°N, 80.1°W. However, such a small change is hardly discernible on the scale of the maps reproduced in Chart Series A. For such minor discrepancies, when the shift in track was less than 25 nautical miles, the original maps were used as they appeared in (23).

Additional data sources for the period through 1963 include: U.S. Navy Annual Tropical Cyclone Reports (101, 102); Bowden (8); Carney and Hardy (14); Carter (15); Cambriaso (12); Purvis (76); U.S. Army Air Force (97); U.S. Army Corps of Engineers (98, 99); and various notes on hurricanes in Jamaica, W.I. (60).

5.3 Data Sources 1964–1980

The "first-guess" in the preparation of the charts for the additional 17 years, 1964 through 1980, were the annual summary reports of Atlantic tropical cyclone activity prepared by staff members of the NHC. The primary medium for the dissemination of these annual reports is the *Monthly Weather Review* (105, 106, 107). In addition, summary articles are tailored to specific user groups and appear annually in the *Mariners Weather Log* (55) and in the popular weather magazine, *Weatherwise* (54). Since 1963, annual summary articles dealing with the genesis of Atlantic tropical cyclones also have appeared in the *Monthly Weather Review* (84, 32). Finally, beginning with the 1974 season, annual articles describing other aspects of each hurricane season, such as tabulated storm positions (best-track), reconnaissance and satellite storm positions, and forecast verifications have been prepared (51, 44, 46) by staff members at the National Hurricane Center.

Each of the annual tropical cyclone track charts that appear in individual issues of the *Monthly Weather Review* for the period 1964 through 1980 was redrafted in the same general format and with the same Lambert Conformal Projection used in Technical Paper 55 (23). In most cases, the location of the best-track storm position was obtained from original reference material (67) maintained by the National Hurricane Center and the Environmental Research Laboratories' National Hurricane Research Laboratory (NHRL), Coral Gables, Fla. The maps, beginning with the 1968 season, include the subtropical stages of the storm tracks as determined by Hebert and Poteat (43). The 1970 map also includes the unnamed storms discussed by Spiegler (88).

Determination of the storm tracks for the years following 1963 was obviously less burdensome than for the earlier years; the only complicating factor was the need to deal with the concept of subtropical cyclones. The decision to include the latter storms was based on climatological considerations. In earlier years, subtropical systems were not formally recognized and, in most cases, they were designated as tropical systems. Consequently, failure to include these systems could alter the tropical cyclone climatology for the years following the introduction of the subtropical concept.

6. ACCURACY OF TRACKS AND INTENSITY CLASSIFICATIONS

Although tropical cyclones may traverse thousands of miles, they spend most of their lives over, and indirectly derive their energy from, oceanic areas. Before the era of aircraft reconnaissance and weather satellites, the detection of such storms was dependent upon chance encounters with shipping or populated areas. Over the Atlantic basin, the intersection of mean tropical cyclone tracks with shipping lanes and populated island areas makes it unlikely that major storms would have gone completely undetected, even well back in the 19th century. However, even with the knowledge of a storm's presence, it is difficult, without additional observational tools, to specify the exact location of a storm center and its intensity. There is a chance, too, that weaker, short duration storms could have gone completely undetected.

After the introduction of continuous weather satellite surveillance (see fig. 2), there is little chance that a tropical cyclone would go undetected. There also is a high probability that the center (eye) of the storm could be located within 25 nautical miles of its actual position and the intensity determined to within 10 knots of its actual intensity (83). Since all of the storm tracks and intensity classifications for the 1964 through 1980 Atlantic hurricane seasons were prepared with the benefit of satellite imagery (as well as aircraft reconnaissance and other data), the track accuracy should be near optimum, considering the scale of the maps and the scale of motion depicted.

Agencies responsible for determining earlier storm tracks and intensities did not have the benefit of satellite data and, indeed, before 1944, of aircraft reconnaissance. Consequently, the over-water portions of these earlier tracks are subject to considerable uncertainties. There were, however, some historical observational milestones in track accuracy. The subject is treated in some detail by Cry (23), and much of the following material is quoted directly or indirectly.

For many years following the establishment of the U.S. Government Weather Service in 1870, data for a precise determination of the location and intensity of tropical cyclones were scarce, widely scattered, of generally poor quality, and sometimes conflicting. Reports from United States land stations were relayed to central forecast offices by telegraph, but observations from ships were not received until the vessels returned to port, sometimes months later. Although such late reports were of no immediate value for forecasting purposes, they were used extensively for the construction of tracks of all major storms occurring over the oceans. These tracks appeared in the International Meteorology Section of the *Monthly Weather Review* for several years. The files of marine observations also served as a basic source for the work of Garriott (33), Fassig (29), Mitchell (64, 65, 66) and others.

The first operational radio weather report from a ship underway was received December 3, 1905; the first message reporting a hurricane was sent August 26, 1909, by the *SS Cartago* from the southern Gulf of Mexico near the coast of Yucatan. The amount and quality of marine weather data have increased gradually during the succeeding years. During the June–November tropical cyclone season of 1935, more than 21,000 observations were received from the tropical portions of the Atlantic. By 1959, the number of observations from the ships during the corresponding period exceeded 64,000. Since the early 1960's, the number has increased less rapidly, because of changes in the characteristics of the shipping industry.

Technological advances since World War II have resulted in more precise tropical cyclone detection, positioning, and intensity determination. Many of these advances, together with earlier noteworthy events, are depicted in figure 2. Improved radiosonde and rawinsonde equipment for measuring weather conditions above the earth's surface has provided additional knowledge of factors affecting tropical cyclone motion and intensity. The use of aircraft to obtain data inside hurricanes was found to be feasible in 1943 (93), and U.S. Air Force and Navy [3] aircraft have made routine reconnaissance of tropical cyclones

[3] Navy hurricane reconnaissance was discontinued after the 1974 season.

since 1944. Before the operational availability of satellite data around the mid-1960's, these flights proved especially important in the early detection of storms.

Currently, tropical cyclones are usually detected by satellite, although aircraft are required to specify precise environmental data in and around the storm. The NOAA Research Facilities Center (formerly Research Flight Facility), Miami, Fla., operates several aircraft with sophisticated instrumentation for the collection of detailed data, used primarily for research but also useful for operational tropical cyclone tracking.

A significant milestone occurred during the 1977 hurricane season when a complex communications system known as the Aircraft Satellite Data Link (ASDL) system enabled Research Facilities Center aircraft measurements taken inside a storm at 60-second intervals to be received and plotted by a National Hurricane Center computer within a few seconds. It is significant to contrast this with an earlier statement concerning the receipt of ship observations months late. Thus, the temporal gap between the taking of a weather observation and receipt of the message by the ultimate user appears to be closed.

The World War II development of storm-tracking radar and subsequent improvements in range and accuracy further increased observational capabilities. An extensive network of powerful coastal radars is now in operation. Radar is particularly useful in detecting sudden changes in the direction of tropical cyclone motion when these storms are within 250 miles of the radar site. This permits "last minute" adjustments in community preparedness efforts as these storms move ashore.

An important product of the NASA space program is the development of weather satellites, now the standard observational tool for the detection and monitoring of tropical cyclones on a worldwide scale. A classic example of a satellite view of a hurricane is given by the cover illustration. By reviewing thousands of such pictures, Dvorak (27) and Hebert and Poteat (43) were able to specify systematic procedures to estimate the location of the center and the intensity of the storm. Satellites also provide the means of obtaining direct or indirect measurements of other environmental quantities, such as wind, temperature, moisture, and rainfall around the storm (1, 10, 38, 52). Although the first pictures of a tropical cyclone were transmitted by the polar orbiting TIROS-I satellite in 1960, it was not until 1966 that the first completely operational weather satellite, ESSA-I, was placed in orbit. The ESSA series were also polar orbiting satellites and provided views of tropical cyclones once per day. By the late 1960's, geostationary satellites allowed continuous daytime surveillance and, in 1974, the nighttime viewing gap was closed with the launch of the first Geostationary Operational Environmental Satellite (GOES). Further information is in figure 2. A history of the development of meteorological satellites is given by Allison, et al. (6).

In recent years, marine meteorological data buoys have been developed and deployed. These floating data platforms, anchored at strategic locations, transmit observations of wind, pressure, waves, ocean and air temperatures in and around tropical cyclones and other weather systems.

The quality of the charts and figures presented in this report reflects the variation in amount and quality of observational data. In early years, the observations simply did not exist, and the tracks were extrapolated from fragmentary information. Other than a gradual increase in quality of the observational material over the years, there is no way to determine the reliability of a particular storm track. However, those tracks that crossed populated areas can be expected to be reasonably accurate, even back into the previous century. Thom (95) and Cry (23) cite statistical evidence that, compared with the storms that remained at sea, most tropical cyclones that crossed the United States coastline were probably detected.

The 110 years from 1871 through 1980 cover the complete period of the development of meteorology and organized weather services. The period begins in an era when observations were simple and relatively rare, before the details of the nature and characteristics of atmospheric disturbances were understood. Today, a widespread network of land stations, ships, aircraft, radar, satellites, and data buoys, using complex and sophisticated instrumentation and communication, is available for the detection, tracking, and understanding of tropical cyclones.

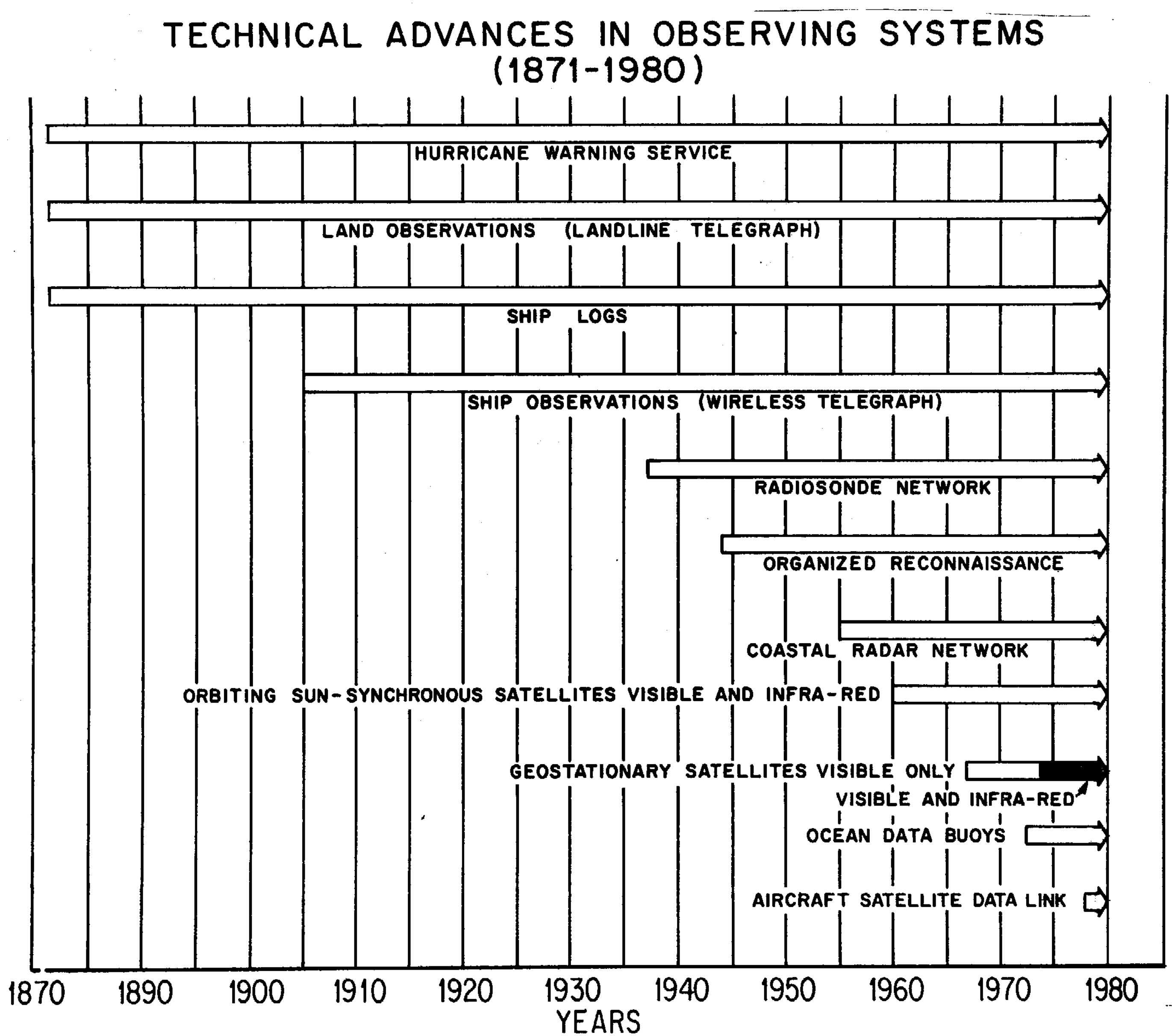

Figure 2.—Technical advances in systems for observing tropical cyclones, 1871 through 1980.

7. NORTH ATLANTIC TROPICAL CYCLONE TRACKS

7.1 Chart Series A

The tracks of all recorded Atlantic tropical cyclones for each year from 1871 through 1980 are presented in Chart Series A (appendix A). For the period before 1964, several steps were used by Cry (23) to obtain the final tracks. First, all cyclones considered to be of tropical origin in any given year were listed together with all relevant intensity data. Second, all versions of each storm track were plotted on charts. Comparisons of these differing interpretations and evaluation of information from all sources, including daily synoptic charts (97, 109, 111, 112, 113), were made, and the track configuration for each storm most consistent with all the data was selected. These positions and intensities were plotted on the annual charts of Series A.

The objective was to depict accurately and completely the position and intensity of each significant tropical cyclone in the North Atlantic basin throughout its existence. Unfortunately, the quality of the data prevented full attainment of this goal; many positions and intensities, particularly for the earlier years, are estimates, representing compromises to significant differences in the references.

Delineation of intensity stages was found to be unrewarding before the period when daily synoptic charts for the entire area were available; consequently, no indications of intensity have been made for 1871 through 1885. A simple classification of "tropical storm" or "hurricane" was made for the years 1886 through 1898, and tracks showing intensity were prepared from 1899 onward. The tropical depression (development) stage was included starting in 1951. Finally, an additional breed of storms, *subtropical*, was added starting in 1968. Intensity and classification criteria are given in table 1.

Before 1950, there was no formal nomenclature for the identification of cyclones. Noteworthy storms were informally designated by such descriptive terms as "Yankee hurricane," "New England hurricane," "Labor Day storm," "Galveston storm," etc. Official naming of Atlantic tropical cyclones began in 1950. Initially, the 1950 vintage phonetic alphabet (ABLE, BAKER, CHARLIE, and so on) was used. However, for the 1953 season, the practice of using women's names, first used in the western Pacific during World War II, was introduced. This convention continued until 1979 when both men's and women's names were used alternately. In Chart Series A, certain storms lack names, even after the formal naming of tropical cyclones began. Some of these remained subtropical. Others, originally thought to be nontropical, were added after post-analysis indicated that they did have tropical characteristics.

7.2 Chart Series B

Another series of charts (Series B) provides groupings of storms according to selected intraseasonal periods. A similar series presented by Cry (23) has always been useful for both operational and research purposes. The charts of Series A were manually prepared. However, Chart Series B was computer-drawn with NOAA computer-graphics facilities. Computer methods also allow the use of any map projection. For a number of reasons, most relating to convenience, a Mercator projection, true at 22.5°N latitude, was used in Chart Series B. In a manner similar to that employed by Cry, the storm tracks are presented without regard to identification other than that they began sometime during the specified time period. Additional labeling would clutter the charts and detract from their main purpose, which is the identification of spatial and temporal shifts in tropical cyclone occurrence.

The first chart of Series B was introduced on page iv as figure 1. This rendition of the entire 793-storm sample has limited utility, but serves to illustrate the bounds of the North Atlantic tropical cyclone basin. The relative frequency of storms in any given area also can be roughly identified by the track density. Other charts in Series B are presented for May through December and for 10- (or 11-) day periods, June 1 through November 30.

The tracks were drawn by means of a computer interpolation routine suggested by Akima (3). Storm positions are specified on a computer magnetic tape at 6-hourly intervals. With these as anchor points, a reasonably faithful rendition of the hand-drawn tracks depicted on Chart Series A can be expected. In a few cases, however, the 6-hourly positions are insufficient to define tight loops and sudden changes in direction.

The charts in Series B include storms which began, regardless of intensity, classification, or duration, within the designated period. This convention differs slightly from that used in preparation of tables 2 and 3 where the depression stage was excluded. Also, specified on each chart is the total number of storms included in the period.

Table 2.—*Number of recorded Atlantic tropical cyclones (excluding depressions and, after 1967, including subtropical cyclones) which reached at least tropical storm intensity in specified month, 1871–1980. (Refer to Table 4 for summaries of these data.)*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1871						2		2	2				6
1872							1	1	2	1			5
1873						1		1	3				5
1874							1	1	4	1			7
1875									3	1			4
1876									2	1			3
1877								1	4	2	1		8
1878							1	1	3	4	1		10
1879								3	1	3	1		8
1880						1		4	2	2			9
1881								4	1	1			6
1882									2	1			3
1883								2	1	1			4
1884									2	1			3
1885								3	4	1			8
1886						3	1	2	2	2			10
1887					1		2	2	3	6	1	2	17
1888						1	1	2	2	1	2		9
1889					1	1		1	5	1			9
1890								1					1
1891							1	2	3	4	1		11
1892						1		1	4	3			9
1893						1	1	5	3	1	1		12
1894								2	1	3			6
1895								2	1	3			6
1896							1	1	2	2			6
1897								1	2	2			5
1898								2	5	2			9
1899							1	2	1	2			6

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1900								1	3	3			7
1901						1	2	2	3	2			10
1902						2			1	1	1		5
1903							1	1	4	2	1		9
1904						1			1	3			5
1905									3	2			5
1906						2		1	3	4	1		11
1907						1			2	1			4
1908			1				1	1	3	2			8
1909						2	2	2	2	1	1		10
1910								1	2	1			4
1911								2	1	1			4
1912						1	1		1	2	1		6
1913						1		1	1	1			4
1914									1				1
1915							1	3	1				5
1916						1	2	3	4	3	1		14
1917								2	1				3
1918								3	2				5
1919							1		1		1		3
1920									4				4
1921						1			3	2			6
1922						1			1	2			4
1923								1	1	5			7
1924						1		2	2	2	1		8
1925									1		1		2
1926							2	1	5	2	1		11
1927								1	3	3			7
1928								2	3	1			6

Table 2.—*Number of recorded Atlantic tropical cyclones (excluding depressions and, after 1967, including subtropical cyclones) which reached at least tropical storm intensity in specified month, 1871–1980. (Refer to Table 4 for summaries of these data.)—Continued*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1929						1			1	1			3
1930								2					2
1931						1	1	2	3	1	1		9
1932					1			3	3	3	1		11
1933					1	1	3	7	5	3	1		21
1934					1	1	1	2	2	3	1		11
1935								3	1	2			6
1936						3	2	6	4	1			16
1937							1	2	6				9
1938								3	1	3	1		8
1939						1		1	1	2			5
1940					1			3	2	2			8
1941									4	2			6
1942								3	3	3	1		10
1943							1	2	4	3			10
1944							3	2	4	2			11
1945						1	1	4	3	2			11
1946						1	1	1	1	2			6
1947							1	2	3	3			9
1948					1		1	2	3	1	1		9
1949								3	7	2	1		13
1950								4	3	6			13
1951					1			3	3	3			10
1952		1						2	2	2			7
1953					1			3	4	4	1	1	14
1954						1	1	2	4	1	1	1	11
1955							1	4	5	2			12
1956						1	1	1	4		1		8
1957						2		1	4	1			8

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1958						1		4	4	1			10
1959					1	2	2	1	3	2			11
1960						1	2	2	2				7
1961							1		6	2	2		11
1962								2	1	2			5
1963								2	5	2			9
1964						1	1	3	5	1	1		12
1965						1		2	2	1			6
1966						1	4	1	4		1		11
1967								1	4	3			8
1968						3		1	3	1			8
1969							1	5	6	5	1		18
1970					1		1	3	3	2			10
1971							1	4	6	1	1		13
1972					1	1		2	2		1		7
1973							2	2	2	2			8
1974						1	1	4	4	1			11
1975						1	1	2	3	1		1	9
1976					1		1	5	2	1			10
1977								1	3	2			6
1978	1						1	4	3	3			12
1979						1	2	3	2	1			9
1980								3	5	1	2		11
1981													
1982													
1983													
1984													
1985													
1986													

Table 3.—*Number of storms listed in Table 2 which eventually became hurricanes. (Refer to Table 4 for summaries of these data.)*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1871													
1872													
1873													
1874													
1875													
1876													
1877													
1878													
1879													
1880													
1881													
1882													
1883													
1884													
1885													
1886						2	1	2	2	1			8
1887							1	2	3	2	1	1	10
1888						1		2		1	1		5
1889					1			1	3				5
1890								1					1
1891							1	2	3	2			8
1892								1	2	1			4
1893						1	1	5	3				10
1894								1	1	3			5
1895								1		1			2
1896							1	1	2	2			6
1897								1	1				2
1898								2	2				4
1899							1	2	1	1			5
1900								1	2				3
1901							1	2					3
1902						1			1	1			3
1903							1	1	3	2	1		8
1904									1	1			2
1905										1			1
1906						1		1	2	2			6
1907													0
1908			1				1		2	1			5
1909							1	1	1	1			4
1910									2	1			3
1911								2	1				3
1912									1	2	1		4
1913						1		1	1				3
1914													0
1915								3	1				4
1916						1	2	3	2	2	1		11
1917								1	1				2
1918								2	1				3
1919									1				1
1920									4				4
1921						1			2	1			4
1922									1	1			2
1923								1	1	1			3
1924								2	1	1	1		5
1925											1		1
1926							2	1	4	1			8
1927								1	3				4
1928								2	1	1			4
1929						1			1	1			3
1930								2					2
1931									2				2
1932								3	1	1	1		6
1933						1	1	3	3	2			10
1934						1	1	1	1	1	1		6
1935								2	1	2			5
1936						1	1	3	2				7
1937									3				3
1938								2	1				3
1939								1		2			3
1940								3	1				4
1941									3	1			4
1942								3			1		4
1943							1	1	2	1			5
1944							2	1	3	1			7
1945						1		1	1	2			5
1946							1		1	1			3
1947								2	1	2			5
1948								1	3	1	1		6

Table 3.—*Number of storms listed in Table 2 which eventually became hurricanes. (Refer to Table 4 for summaries of these data.)—Continued*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1949								2	4	1			7
1950								4	3	4			11
1951					1			2	2	3			8
1952								2	2	2			6
1953								2	3	1			6
1954						1		2	3	1		1	8
1955								3	5	1			9
1956							1	1	1		1		4
1957						1			2				3
1958								3	3	1			7
1959						1	2		3	1			7
1960							1	2	1				4
1961							1		5	1	1		8
1962								1		2			3
1963								2	4	1			7
1964								1	4	1			6
1965								2	1	1			4
1966						1	3	1	1		1		7
1967								1	3	2			6
1968						2		1	1	1			5
1969								4	4	3	1		12
1970					1			1	1	2			5
1971								2	4				6
1972						1		1	1				3
1973							1	1	1	1			4
1974								2	2				4
1975							1	2	3				6
1976								4	1	1			6
1977								1	3	1			5
1978								2	2	1			5
1979							1	2	2				5
1980								3	3	1	2		9
1981													
1982													
1983													
1984													
1985													
1986													

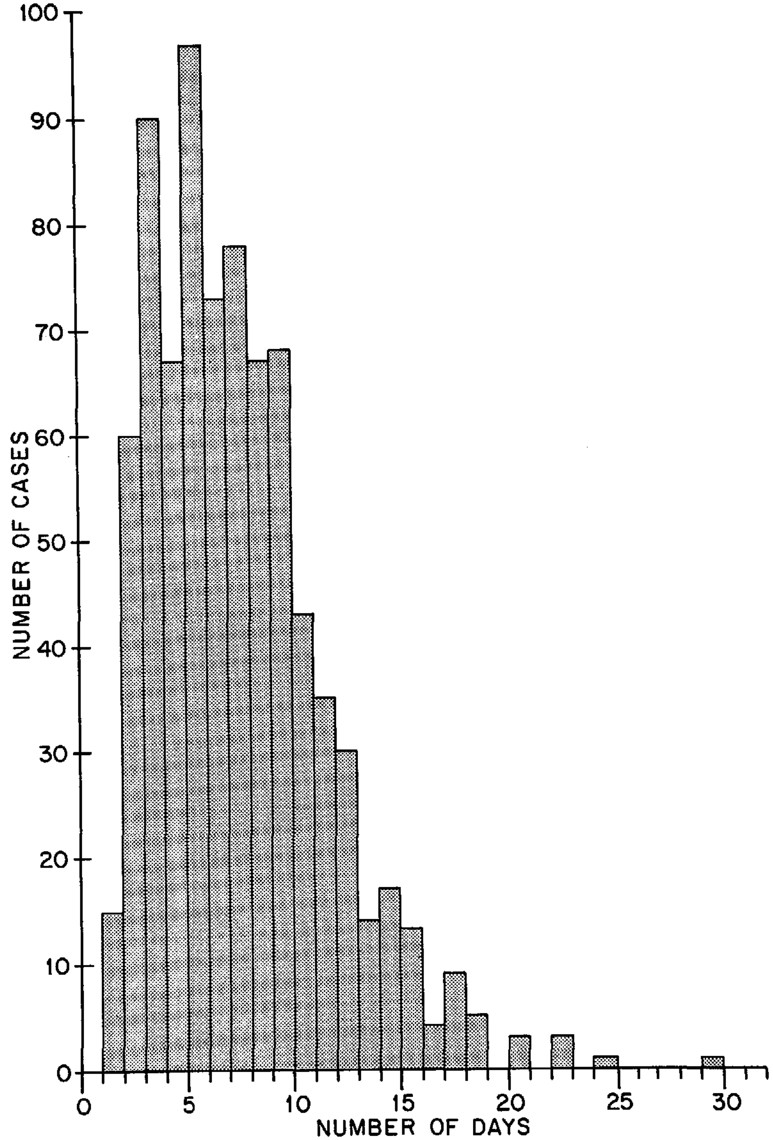

Figure 3.—Distribution of observed duration (number of days, including depression stage) of Atlantic tropical cyclones, 1886 through 1980.

8. FREQUENCY OF NORTH ATLANTIC TROPICAL CYCLONES

8.1 Monthly and Annual Frequencies

Tables 2 and 3 present monthly and annual frequencies of recorded Atlantic basin tropical cyclones and hurricanes for each year 1871 through 1980. The hurricane stage was not identified before 1886, so no hurricane entries appear in table 3 for 1871–1885. The frequencies for some months and years differ slightly from those given in a similar table by Cry (23). The differences result from minor revisions to some of the tracks (section 6). Computer specification of storm positions at 6-hourly intervals, rather than at 12-hourly intervals, as used by Cry, also may have shifted one or two storms to earlier or later months. Grouping in this table is based on the initial date of tropical storm intensity or the detection of the storm; the tropical depression stage was not included. For example, a storm reaching tropical storm strength on August 31, reaching hurricane strength on September 5, and finally dissipating on September 20, would be assigned as a hurricane beginning in August. No entries would be made for September. This convention differs from that used in some other tabulations and Chart Series B.

Based on all Atlantic tropical cyclone tracks from 1886 through 1980, the duration of a tropical cyclone, including the depression stage (if recorded), averages about eight days but, as shown in figure 3, may vary from less than two to as many as 30 days. The modal (most frequently occurring) duration is six days. The ability to detect tropical cyclones earlier has improved in recent years such that the distribution shown in figure 3 is somewhat biased towards lower values. Very brief storms typically form in the Gulf of Mexico and dissipate over adjacent land areas before reaching maturity. Storm number 3, 1946, is a good example. Hurricanes of extreme duration include Ginger, September 5 to October 5, 1971 and Inga, September 20 to October 14, 1969. Both storms meandered slowly around the western and central Atlantic for much of their existence. Other long-duration storms include those which form in the eastern Atlantic, travel westward, recurve just before reaching the United States and then move northeastward across the open Atlantic.

The number of storms occurring in any given year varies widely. Insofar as storms reaching at least tropical storm strength are concerned, there were two years, 1890 and 1914, that observed but one storm while 21 tropical storms or hurricanes occurred in 1933. There were no storms that reached hurricane strength in both 1907 and 1914 while 12 hurricanes occurred in 1969. Frequency distributions of these are given in figures 4 and 5.

One may question the adequacy of these data. After the middle 1940's, when aircraft reconnaissance began, it is unlikely that even weak, short-duration storms have been undetected. This was not always the case: some small, weak tropical storms may have gone undocumented in the earlier years, and storms that were detected could have been misclassified as to intensity.

In addition to observational problems, there is a strong possibility that other natural trends exist in the frequency of tropical cyclones. The possible effect of large-scale anomalies in sea-surface temperature, for example, is discussed later in this section.

Upward or downward trends in the frequency of tropical cyclones, if not accounted for, make the average frequency a function of the period of record included in the summary. To illustrate, data from tables 2 and 3 have been averaged over three periods: 1886 through 1980; 1910 through 1930; and 1944 through 1980. The first period begins with the year when it was possible to distinguish between tropical storms and hurricanes; the period 1910 through 1930 was a minimum in frequency with an average of only about five storms per year; and the last period begins with the introduction of organized aircraft weather reconnaissance. The averages for the three periods appear in

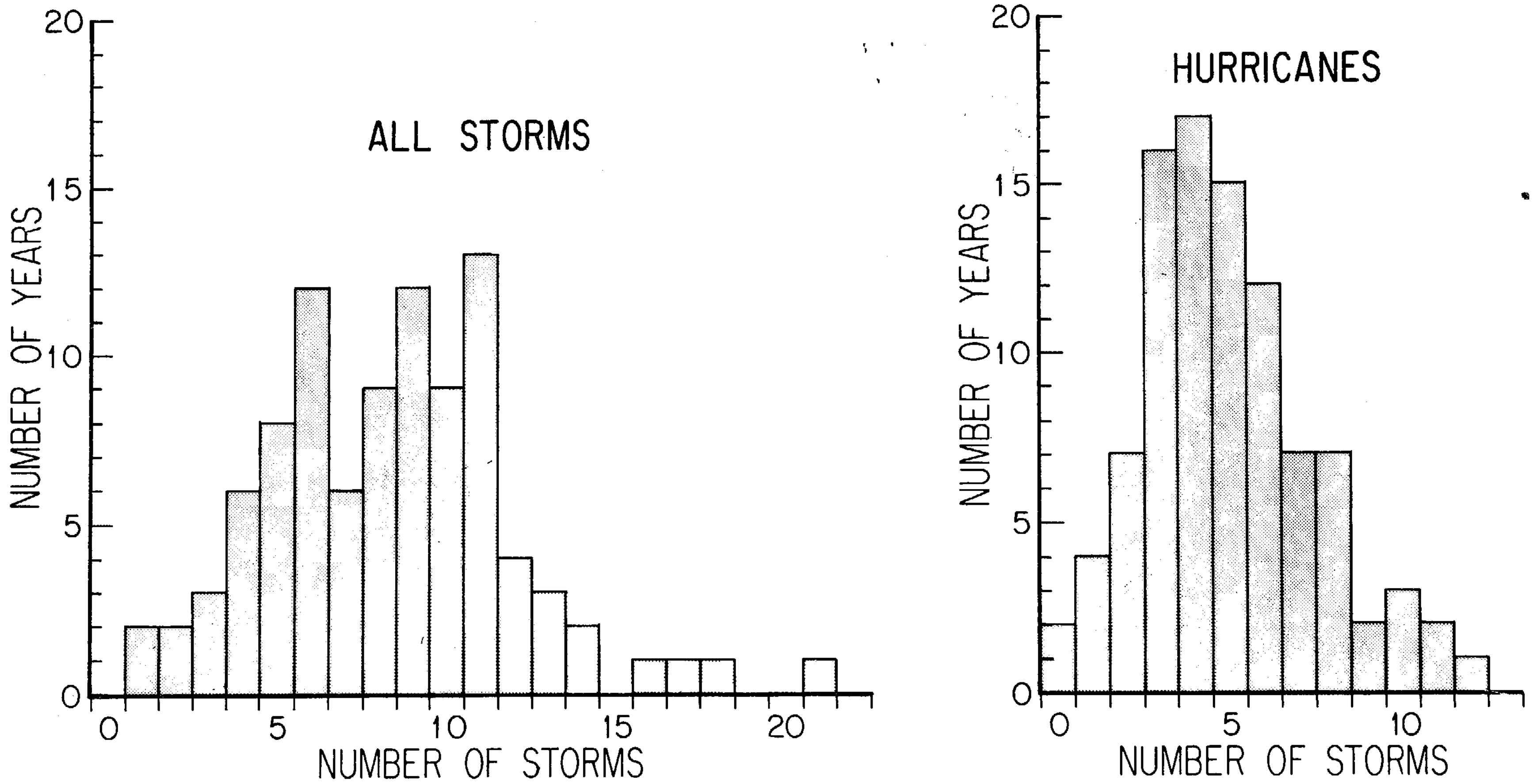

Figure 4.—Distribution of annual number of tropical cyclones reaching at least tropical storm strength (left) and hurricane strength (right), 1886 through 1980. The average number of such storms is 8.4 and 4.9, respectively (see Table 4).

table 4 and substantial difference in the monthly and annual frequencies can be noted. The period 1944 through 1980 probably best represents Atlantic tropical cyclone frequencies as they currently exist, although some decline in frequency, particularly in the number of storms affecting the United States (fig. 9), has been noted in recent years.

The term "average number of" as used in table 4 is somewhat misleading as it implies other than the discrete occurrence or nonoccurrence of a tropical cyclone. For this reason, it is desirable to fit the data to a discrete probability distribution. Such a distribution, properly identified and corrected for trends in the data, will give a better estimate of expected occurrence rates than the relative frequencies already observed. The Poisson distribution, described by Burington and May (11), is often used for these better estimates.

To fit the Poisson distribution, it is necessary to estimate the true mean of the event. However, because of the trends in the data, it is difficult to specify the true mean. It is likely that some of the irregular upward trend in tropical cyclone occurrence over the years can be explained as observational deficiencies in the earlier years. This is an artificial trend. However, there may be other real superimposed trends in the storm frequencies over the years. Wendland (116), for example, points out the effect of varying sea surface temperatures on the long-term frequencies of Atlantic tropical cyclones. In addition, there may be other subtle trends that are difficult to isolate because of the relatively short period of record.

Table 4.—*Total and average number of tropical cyclones (excluding depressions and including subtropical systems) beginning in each month.*

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Tropical storms and hurricanes		1	1	1	0	13	50	61	186	267	173	35	5	793
Average		*	*	*	0.0	0.1	0.5	0.6	2.0	2.8	1.8	0.4	0.1	8.3
	1886–1980													
Hurricanes only		0	0	1	0	3	21	32	135	171	86	17	2	468
Average		0.0	0.0	*	0.0	*	0.2	0.3	1.4	1.8	0.9	0.2	*	4.9
Tropical storms and hurricanes		0	0	0	0	0	7	7	24	39	26	6	0	109
Average		0.0	0.0	0.0	0.0	0.0	0.3	0.3	1.1	1.9	1.2	0.3	0.0	5.2
	1910–1930													
Hurricanes only		0	0	0	0	0	4	4	21	29	12	4	0	74
Average		0.0	0.0	0.0	0.0	0.0	0.2	0.2	1.0	1.4	0.6	0.2	0.0	3.5
Tropical storms and hurricanes		1	1	0	0	7	20	31	91	130	66	14	3	364
Average		*	*	0.0	0.0	0.2	0.5	0.8	2.5	3.5	1.8	0.4	0.1	9.9
	1944–1980													
Hurricanes only		0	0	0	0	2	8	14	62	87	41	7	1	222
Average		0.0	0.0	0.0	0.0	0.1	0.2	0.4	1.7	2.4	1.1	0.2	*	6.0

Note: Data are summarized from Tables 2 and 3. Asterisk (*) indicates less than 0.05 storms.

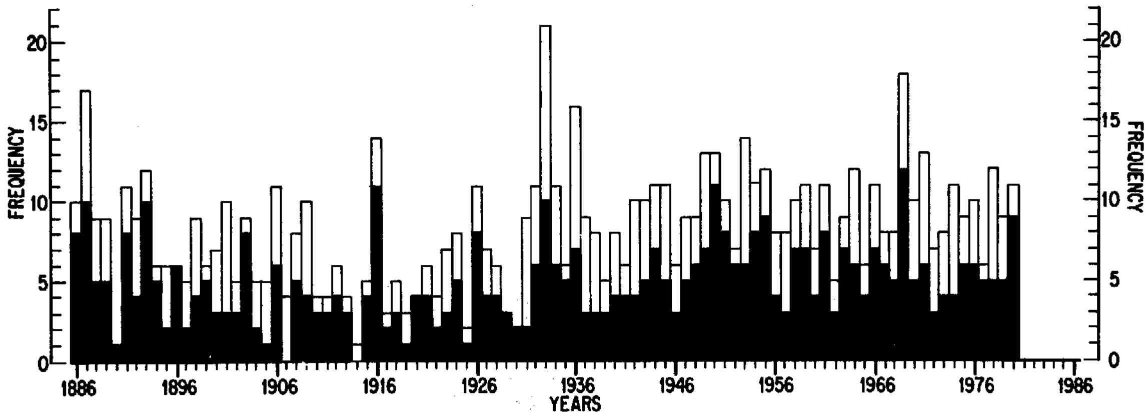

Figure 5.—Annual distribution of the 793 recorded Atlantic tropical cyclones reaching at least tropical storm strength (open bar) and the 468 reaching hurricane strength (solid bar), 1886 through 1980. The average number of such storms is 8.4 and 4.9, respectively (see Table 4).

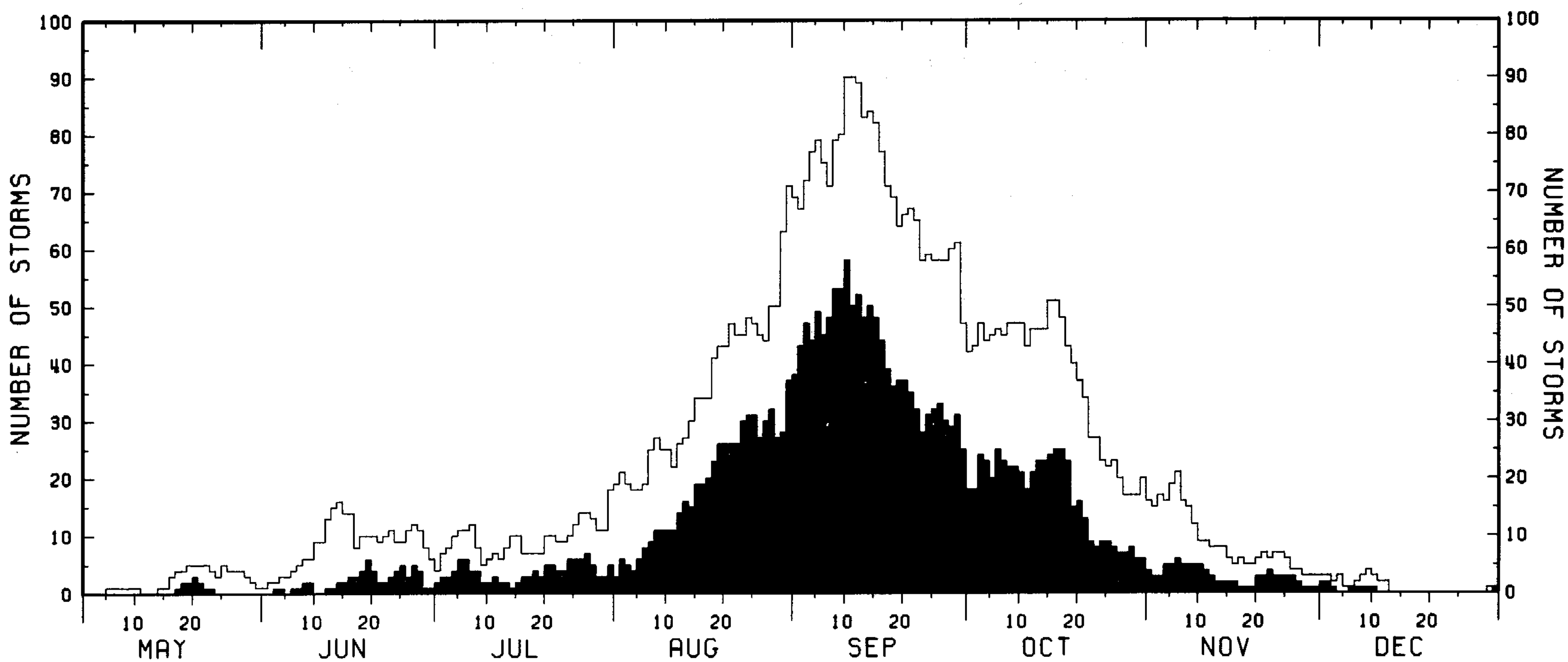

Figure 6.—Number of tropical storms and hurricanes (open bar) and hurricanes (solid bar) observed on each day, May 1–December 31, 1886 through 1980.

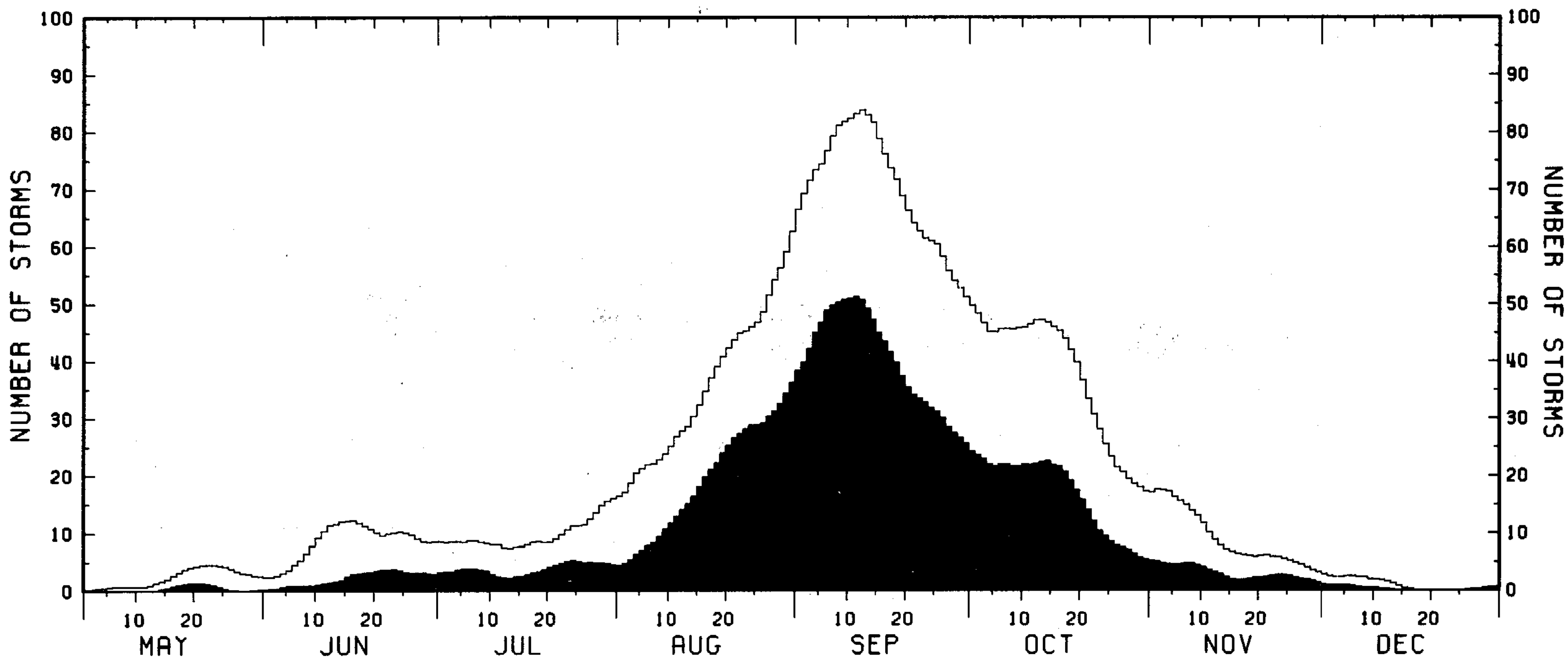

Figure 7.—Same as Fig. 6 except data smoothed by a 9-day moving average.

Because of the above cited difficulties and others, the decision was made not to attempt to fit the data to a probability distribution. That is not to say that an in-depth study such as that performed by Thom (95) and applied by Cry (23) to the tropical cyclone and hurricane frequencies for 1901 through 1963 could not be extended to include additional years of record. However, such a study must be considered beyond the scope of the present efforts, which are geared toward presenting, rather than interpreting, the data.

8.2 Daily Frequencies

Figures 6 and 7 illustrate the incidence of tropical cyclones over the North Atlantic basin on a daily basis for the 8-month period that covers the principal season. Except for the longer period of record, the figure is similar to one presented by Cry (23). In addition, however, the frequencies have been smoothed using a 9-day moving average. These smoothed frequencies eliminate much of the "noise" inherent in the raw data, yet preserve the larger scale seasonal cycles.

The seasonal fluctuations in tropical cyclone frequency include, in chronological order, a slight maximum around mid-June, followed by a slight decline until mid-July, and a gradual increase in frequency until just before mid-September. A somewhat irregular decline in frequency occurs thereafter, interrupted by a slight increase in mid-October. The October maximum is somewhat less sharp than that given by Cry (23) because of the inclusion of extra years of data.

The "official" Atlantic hurricane season extends from June 1 through November 30. However, as seen from figure 8, the season occasionally begins or ends outside of this period. The figure presents a cumulative percentage frequency distribution of the date of detection of the first and the date of dissipation of the last tropical cyclone of storm or hurricane intensity for each season from 1886 through 1980. The median (midpoint of the distribution) beginning date is June 27, and the median ending date is October 29. There are no well-defined statistical relationships between the beginning and ending dates of the tropical cyclone season; that is, seasons which began early did not necessarily end early (or late), and seasons which began late did not necessarily end late (or early). However, there is a weak statistical relationship between starting date and the number of storms such that seasons which start early tend to have more storms. However, the low correlation coefficient ($r = -0.35$) indicates that there are many exceptions to this rule.

8.3 Areas of Formation

Seasonal shifts in the principal areas of tropical cyclone formation over the Atlantic basin have been recognized for many decades, and the reader is referred to standard references such as Crutcher and Quayle (21), Dunn (25), or Dunn and Miller (26) for quantitative and qualitative discussions. Chart Series B presents a convenient means of identifying the temporal and spatial variations of these patterns. Early season tropical cyclones are almost exclusively confined to the western Caribbean and the Gulf of Mexico. However, by the end of June or early July, the area of formation gradually shifts eastward, with a slight decline in overall frequency of storms. By late July, the frequency gradually increases, and the area of formation shifts still farther eastward. By late August, tropical cyclones form over a broad area which extends eastward to near the Cape Verde Islands. The period from about August 20 through about September 15 encompasses the maximum of these "Cape Verde" type storms, many of which traverse the entire Atlantic Ocean. After mid-September, the frequency begins to decline and the formative area retreats westward. By early October, the area is generally confined to longitudes west of 60°W, and the area of maximum occurrence returns to the western Caribbean. In November, the frequency of tropical cyclone occurrence further declines.

Many additional features pertaining to temporal and spatial variations in storm frequency can be identified by careful analysis of Chart Series B. It often is helpful to consider these charts in conjunction with figures 6 and 7, which depict the daily frequencies.

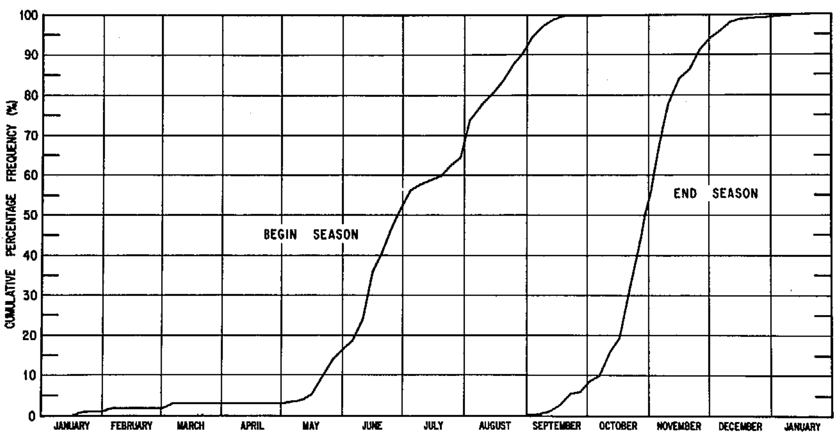

Figure 8.—Cumulative percentage frequency distribution of beginning and ending dates of Atlantic tropical cyclone season, 1886 through 1980. (Dates are of first and last recorded position with at least tropical storm strength.)

8.4 Tropical Cyclones Affecting the United States

Of the 683 tropical cyclones that have been recorded over the Atlantic tropical cyclone basin 1899–1980 (Ref. table 2), a total of 271 or about 40 percent have crossed or passed immediately adjacent to the United States mainland. Fig. 9 shows the year-to-year distribution of these 271 storms. In a NOAA study for the Federal Insurance Administration, Ho, et al. (47) analyzed these and earlier tropical cyclones that affected the United States. Fig. 10, from their study, shows the spatial variability of tropical storm and hurricane incidence along a smoothed and "stretched-out" United States coastline that extends from Texas to Maine (fig. 11) over the period of record, 1871 through 1973. The additional years 1974 through 1980 do not significantly alter the average frequency along the United States coastline, and since Ho, et al. used essentially the same tropical cyclone tracks as given in Chart Series A, figure 10 may be considered compatible with these tracks.

Certain factors should be considered before making inferences from figure 10. First, the chart includes storms ranging in intensity from weak

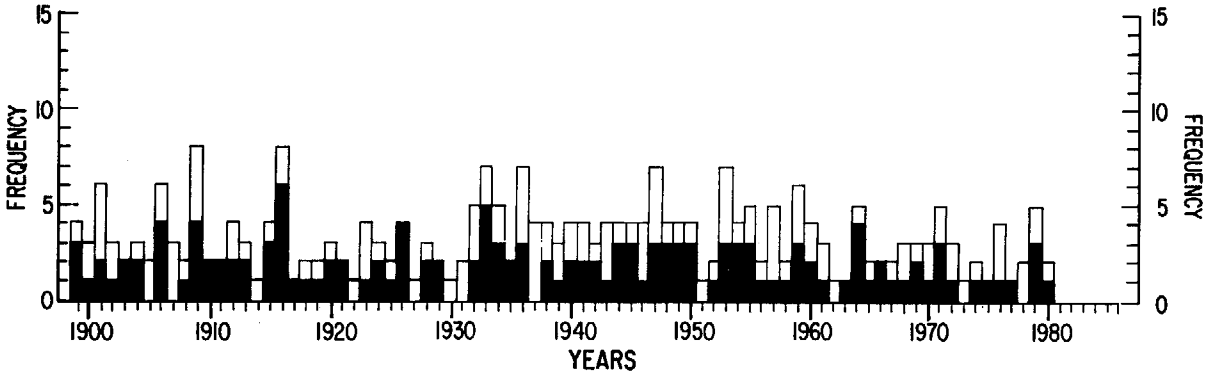

Figure 9.—Annual distribution of the 271 Atlantic tropical storms and hurricanes (open bars) and the 144 hurricanes (solid bars) that have crossed or passed immediately adjacent to the United States coastline (Texas to Maine), 1899 through 1980. The average annual number of such storms is 3.3 and 1.8 respectively. Graph displays one crossing per storm even though multiple crossings may have occurred.

tropical storms to the most intense hurricanes. Second, the frequencies represent long-term averages. For shorter (10 or 20-year) periods, considerable deviation has occurred and will continue to occur in the future. For example, from 1951 through 1960, many more major hurricanes struck the East Coast of the United States than affected the Gulf of Mexico Coast. Figure 10 does not address these short-period variations.

Another factor to be considered pertains to proper interpretation of the term "per 10 nautical miles of coastline." In the Miami area, two storms per 100 years per 10 nautical miles of coast are indicated. This should not be interpreted to mean that the Miami area expects only two storms per century. Storms that strike along the coast in other 10 nautical mile segments, both south and north of Miami, would also affect the area. Indeed, the damage swath from a major hurricane can cover more than 100 miles of coastline. For further details on proper interpretation of figure 10, the reader is referred to the original paper which contains much additional information, including a chart that gives the ratio of hurricanes to tropical storms along the entire coastline, and a chart that can be used to estimate the return periods of hurricanes of various intensities (based upon central pressure) for the entire coast.

Another factor to be considered before making deductions on hurricane or storm damage relative to any given storm track is that the pattern of wind, rainfall, storm surge, and associated damage are rarely symmetrical about the storm track. Wind and storm surge are typically higher in the right semicircle of a storm (as viewed toward the direction of motion) where the storm's motion and wind are complementary. Thus, if the hurricane on the cover photograph were to cross the Mexico coast, the storm could be expected to produce higher winds and a storm surge northward from the center since the counter-clockwise rotating winds and the hurricane's forward speed of motion are both working in the same direction. On the other hand, a storm moving into the Tampa, Fla., area from the southwest generally would bring stronger winds and higher tides southward from the Tampa area.

Other meteorological and geographical factors also contribute to asymmetries such that it is difficult to speculate on damage patterns from the information given in this publication. Also, wind gusts, which may substantially exceed the speed of the sustained wind, must be considered in assessing damage potential. Accordingly, persons needing the specific effect of a historical storm on a given site should seek further meteorological advice. Instrumental documentation of specific weather elements, however, even when storms cross coastlines, is meager. Much must be inferred from immediate post-storm surveys of damage from wind and storm surge.

8.5 Hurricanes Affecting the United States

Figure 10, discussed in section 8.4, gives the combined frequency of both hurricanes and tropical storms. Depending on the area of landfall, approximately 40 to 60 percent of these storms were classified as hurricanes. The observed (or potential) damage from these hurricanes ranged

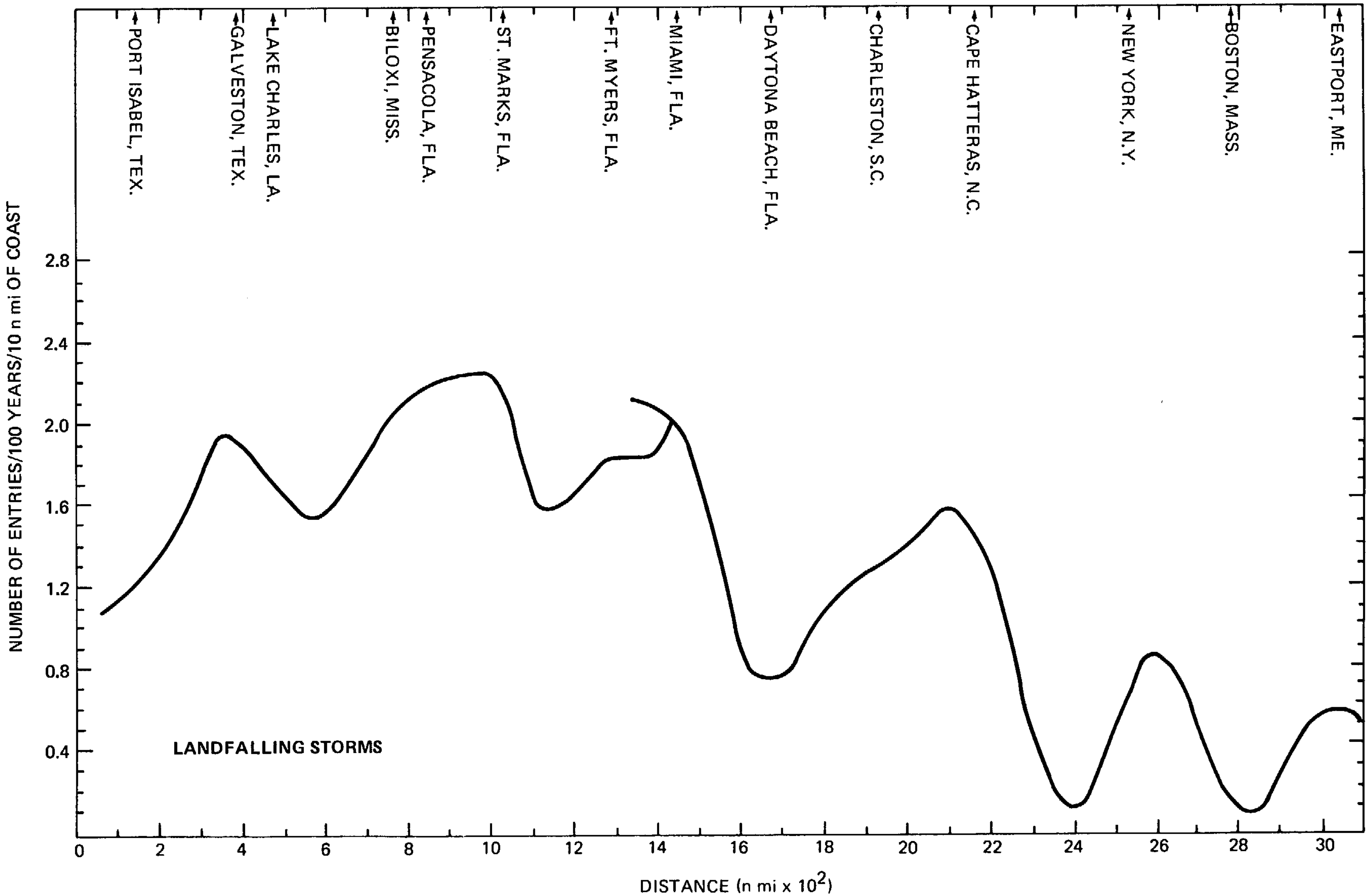

Figure 10.—Smoothed frequency of landfalling tropical storms and hurricanes (1871 through 1973) for the Gulf and East Coasts of the United States. Discontinuity between Miami and Ft. Myers represents Florida Keys. (From Ho, et al. (47), page 21)

Figure 11.—Smoothed United States coastline used in the preparation of figure 10. (From Ho, et al. (47), page 17)

from minimal to catastrophic, depending not only on the intensity of the storm, but upon such factors as size of the storm, coastal configuration, astronomical tides, terrain features, urbanization, and industrialization. To relate hurricane intensity to damage potential, the National Hurricane Center has adopted the Saffir/Simpson (79, 100) Hurricane Scale. This descriptive scale, over a range of categories 1 through 5, is shown in table 5.

Figure 9 shows that 144 hurricanes and 127 tropical storms have crossed or passed immediately offshore to the United States over the 82-year period 1899–1980. Hebert and Taylor (42) carefully analyzed all hurricanes affecting the United States between 1900 and 1974 and classified them according to the Saffir/Simpson damage potential scale. Their listing, with some minor modifications and additions, has been extended backward through 1899 and forward through 1980 and appears in table 6.

The scale numbers assigned by Hebert and Taylor were based primarily upon the central pressure at the time of storm landfall. Certain hurricanes (indicated by an asterisk in Table 6), because of their rapid forward speed, could have produced greater or lesser damage than implied by the scale number depending upon whether the area was located to the right (stronger) or left (weaker) portion of the storm, as viewed toward the direction of motion. The authors (Hebert and Taylor) point out a certain amount of subjectivity inherent in this type of classification, particularly with hurricanes during earlier years and with those moving inland in sparsely settled areas. Consequently, some hurricanes near the borderline between two scale numbers might be classified one way or the other, depending on various considerations such as coastal inundation.

The data presented in table 6 are summarized by State in table 7. Because of their long coastlines, Florida and Texas are further subdivided. In Florida, the north-south dividing line is roughly from Cape Canaveral to Tarpon Springs. In Texas, south is roughly Brownsville to Corpus Christi, central is from north of Corpus Christi to Matagorda Bay, and north is from Matagorda Bay to the Louisiana border. Entries in table 7 may be made for the same hurricane more than once, and sectional totals cannot be summed to get national totals. The initial line of table 7 is an actual count of the number of hurricanes that have affected the United States, where only the highest Saffir/Simpson category in any state has been used. The total (138) is somewhat less than that given

Table 5.—*The Saffir/Simpson (79, 100) Hurricane Scale*

Scale No. 1—Winds of 74 to 95 miles per hour. Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage to other structures. Some damage to poorly constructed signs. And/or: storm surge 4 to 5 feet above normal. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.

Scale No. 2—Winds of 96 to 110 miles per hour. Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings; some window and door damage. No major damage to buildings. And/or: storm surge 6 to 8 feet above normal. Coastal roads and low-lying escape routes inland cut by rising water 2 to 4 hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.

Scale No. 3—Winds of 111 to 130 miles per hour. Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes destroyed. And/or: storm surge 9 to 12 feet above normal. Serious flooding at coast and many smaller structures near coast destroyed; larger structures near coast damaged by battering waves and floating debris. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Flat terrain 5 feet or less above sea level flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.

Scale No. 4—Winds of 131 to 155 miles per hour. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes. And/or: storm surge 13 to 18 feet above normal. Flat terrain 10 feet or less above sea level flooded inland as far as 6 miles. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences on low ground within 2 miles of shore.

Scale No. 5—Winds greater than 155 miles per hour. Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Very severe and extensive damage to windows and doors. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings overturned or blown away. Complete destruction of mobile homes. And/or: storm surge greater than 18 feet above normal. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Massive evacuation of residential areas on low ground within 5 to 10 miles of shore possibly required.

Table 6.—*Chronological listing of and States affected by all category 1 through 5 hurricanes which have hit the United States, 1899–1980.*

Storm number	Year	Month	States affected and category by States	Highest category U.S.	Storm name
2	1899	Aug	NC 3	3	....
6	1899	Oct	SC, NC 1	1	....
1	1900	Sep	TX 4N	4	....
3	1901	Jul	NC 1	1	....
4	1901	Aug	LA, MS 2	2	....
3	1903	Sep	FL 2SE, 1NW	2	....
4	1903	Sep	NJ, NY, CT 1	2	....
2	1904	Sep	SC 1	1	....
2	1906	Jun	FL 1SE	1	....
4	1906	Sep	SC, NC 3	3	....
5	1906	Sep	MS, AL 3	3	....
8	1906	Oct	FL 2SE	2	....
2	1908	Jul	NC 1	1	....
3	1909	Jul	TX 3N	3	....
5	1909	Aug	TX 2S	2	....
7	1909	Sep	LA 4	4	....
9	1909	Oct	FL 3SE (Keys)	3	....
2	1910	Sep	TX 2S	2	....
4	1910	Oct	FL 3SW	3	....
1	1911	Aug	FL 1NW; AL 1	1	....
2	1911	Aug	GA, SC 2	2	....
3	1912	Sep	AL 1	1	....
5	1912	Oct	TX 1S	1	....
1	1913	Jun	TX 1S	1	....
2	1913	Sep	NC 1	1	....
2	1915	Aug	TX 4N	4	....
4	1915	Sep	FL 1NW	1	....
5	1915	Sep	LA 4	4	....
1	1916	Jul	MS,AL3	3	....
2	1916	Jul	MA 1	1	....
3	1916	Jul	SC 1	1	....
4	1916	Aug	TX 3S	3	....
13	1916	Oct	AL 2; FL 2NW	2	....
14	1916	Nov	FL 1SW (Keys)	1	....
3	1917	Sep	FL 3NW	3	....
1	1918	Aug	LA 3	3	....
2	1919	Sep	FL 4SW (Keys); TX 4S	4	....
2	1920	Sep	LA 2	2	....
3	1920	Sep	NC 1	1	....
1	1921	Jun	TX 2C	2	....
6	1921	Oct	FL 3SW, 2NE	3	....
3	1923	Oct	LA 1	1	....
4	1924	Sep	FL 1NW	1	....
7	1924	Oct	FL 1SW	1	....
2	1925	Nov	FL 1SW	1	....
1	1926	Jul	FL 2NE	2	....
3	1926	Aug	LA 3	3	....
6	1926	Sep	FL 4SE, 3SW, 3NW; AL 3	4	....
1	1928	Aug	FL 2SE	2	....
4	1928	Sep	FL4SE, 2NE; GA, SC 1	4	....
1	1929	Jun	TX 1C	1	....
2	1929	Sep	FL 3SE, 2NW	3	....
2	1932	Aug	TX 4N	4	....
3	1932	Sep	AL 1	1	....
5	1933	Jul/Aug	FL 1SE; TX 2S	2	....
8	1933	Aug	NC, VA 2	2	....
11	1933	Sep	TX 3S	3	....
12	1933	Sep	FL 3SE	3	....
13	1933	Sep	NC 3	3	....
2	1934	Jun	LA 3	3	....
3	1934	Jul	TX 2S	2	....
2	1935	Sep	FL 5SW (Keys), 2NW	5	....
6	1935	Nov	FL 2SE	2	....
3	1936	Jun	TX 1S	1	....
5	1936	Jul	FL 3NW	3	....
13	1936	Sep	NC 2	2	....
2	1938	Aug	LA 1	1	....
4	1938	Sep	NY, CT, RI, MA 3*	3*	....
2	1939	Aug	FL 1SE, 1NW	1	....
2	1940	Aug	TX 2N; LA 2	2	....
3	1940	Aug	GA, SC 2	2	....
2	1941	Sep	TX 3N	3	....
5	1941	Oct	FL 2SE, 2SW, 2NW	2	....
1	1942	Aug	TX 1N	1	....
2	1942	Aug	TX 3C	3	....
1	1943	Jul	TX 2N	2	....
3	1944	Aug	NC 1	1	....

Table 6.—*Chronological listing of and States affected by all category 1 through 5 hurricanes which have hit the United States, 1899–1980.—Continued*

Storm number	Year	Month	States affected and category by States	Highest category U.S.	Storm name
7	1944	Sep	NC, VA, NY, CT, RI 3*; MA 2*	3	....
11	1944	Oct	FL 3SW, 2NE	3	....
1	1945	Jun	FL 1NW	1	....
5	1945	Aug	TX 2C	2	....
9	1945	Sep	FL 3SE	3	....
5	1946	Oct	FL 1SW	1	....
3	1947	Aug	TX 1N	1	....
4	1947	Sep	FL 4SE, 2SW; LA; MS 3	4	....
8	1947	Oct	FL 1SE; GA, SC 2	2	....
5	1948	Sep	LA 1	1	....
7	1948	Sep	FL 3SW, 2SE	3	....
8	1948	Oct	FL 2SE	2	....
1	1949	Aug	NC 1	1	....
2	1949	Aug	FL 3SE	3	....
10	1949	Oct	TX 2N	2	....
2	1950	Aug	AL 1	1	Baker
5	1950	Sep	FL 3NW	3	Easy
11	1950	Oct	FL 3SE	3	King
2	1952	Aug	SC 1	1	Able
2	1953	Aug	NC 1	1	Barbara
4	1953	Sep	ME 1*	1*	Carol
8	1953	Sep	FL 1NW	1	Florence
3	1954	Aug	NC 2; NY, CT, RI 3*	3*	Carol
5	1954	Sep	MA 3*; ME 1*	3*	Edna
9	1954	Oct	SC, NC 4*; MD 2*	4*	Hazel
2	1955	Aug	NC 3; VA 1	3	Connie
3	1955	Aug	NC 1	1	Diane
9	1955	Sep	NC 3	3	Ione
7	1956	Sep	LA 2; FL 1NW	2	Flossy
2	1957	Jun	TX 4N; LA 4	4	Audrey
5	1959	Jul	TX 1N	1	Debra
4	1959	Jul	SC 1	1	Cindy
8	1959	Sep	SC 3	3	Gracie
6	1960	Sep	MS 1	1	Ethel
5	1960	Sep	FL 4SW (Keys), 2NE; NC, NY 3*; CT, RI 2*, MA, NH, ME 1*	4	Donna
3	1961	Sep	TX 4C	4	Carla
4	1963	Sep	TX 1N	1	Cindy
5	1964	Aug	FL 2 SE	2	Cleo
6	1964	Sep	FL 2NE	2	Dora
10	1964	Oct	LA 3	3	Hilda
11	1964	Oct	FL 2SW, 2SE	2	Isbell
3	1965	Sep	FL 3SE; LA 3	3	Betsy
1	1966	Jun	FL 2NW	2	Alma
9	1966	Oct	FL 1SW (Keys)	1	Inez
2	1967	Sep	TX 3S	3	Beulah
8	1968	Oct	FL 2NW, 1NE	2	Gladys
3	1969	Aug	LA, MS 5	5	Camille
7	1969	Sep	ME 1	1	Gerda
3	1970	Aug	TX 3S	3	Celia
6	1971	Sep	LA 2	2	Edith
7	1971	Sep	TX 1C	1	Fern
8	1971	Sep	NC 1	1	Ginger
2	1972	Jun	FL 1NW; NY, CT 1	1	Agnes
6	1974	Sep	LA 3	3	Carmen
5	1975	Sep	FL 3NW	3	Eloise
3	1976	Aug	NY 1	1	Belle
2	1977	Sep	LA 1	1	Babe
2	1979	Jul	LA 1	1	Bob
4	1979	Sep	FL 2SE, 2NE; GA 2; SC 2	2	David
6	1979	Sep	AL, MS 3	3	Frederic
1	1980	Aug	TX 3S	3	Allen

Notes:—Storm numbers in column 1 correspond to storms identified by number in Chart Series A. Legend for State abbreviations is given in table 7. Formal storm names as specified in column 6 were not assigned before 1950. Data for years 1900 through 1974 derived from Hebert and Taylor (42). Asterick (*) indicates that the hurricane was moving in excess of 30 miles per hour.

Table 7.—*Number of hurricanes (direct hits) affecting U.S. and individual States 1899–1980 according to Saffir/Simpson Hurricane Scale.*

Area	Category Number 1	2	3	4	5	All	Major Hurricanes (≥ 3)
U.S. (Texas to Maine)	49	33	41	13	2	138	56
Texas (TX)	9	9	8	6	0	32	14
(North)	4	3	2	4	0	13	6
(Central)	2	2	1	1	0	6	2
(South)	3	4	5	1	0	13	6
Louisiana (LA)	5	5	7	3	1	21	11
Mississippi (MS)	1	1	4	0	1	7	5
Alabama (AL)	4	1	4	0	0	9	4
Florida (FL)	16	14	15	5	1	51	21
(Northwest)	9	6	5	0	0	20	5
(Northeast)	1	7	0	0	0	8	0
(Southwest)	5	3	5	2	1	16	8
(Southeast)	4	10	7	3	0	24	10
Georgia (GA)	1	4	0	0	0	5	0
South Carolina (SC)	6	4	2	1 *	0	13	3
North Carolina (NC)	10	3	7	1 *	0	21	8
Virginia (VA)	1	1	1 *	0	0	3	1
Maryland (MD)	0	1 *	0	0	0	1	0
New Jersey (NJ)	1 *	0	0	0	0	1	0
New York (NY)	3	0	4 *	0	0	7	4
Connecticut (CT)	2	1 *	3 *	0	0	6	3
Rhode Island (RI)	0	1 *	3 *	0	0	4	3
Massachusetts (MA)	2	1 *	2 *	0	0	5	2
New Hampshire (NH)	1 *	0	0	0	0	1	0
Maine (ME)	4	0	0	0	0	4	0

Notes: Asterisk (*) indicates that all hurricanes in this category were moving in excess of 30 miles per hour. (Data derived from Hebert and Taylor (42).)

(144) in figure 9. The difference is because Hebert and Taylor determined that six of the hurricanes included in figure 9 (No. 1, 1899; No. 2, 1902; No. 3, 1904; No. 10, 1926; No. 6, 1934; No. 8, 1958) either weakened to below hurricane strength immediately upon reaching the coast or skirted the coast without the storm center actually making landfall.

Thus, over the 82-year period 1899 through 1980, a total of 138 category 1 through 5 hurricanes crossed the United States coastline at one or more points. This is equivalent to an average of five hurricanes every three years. Since some hurricanes affect or threaten more than one coastal segment, *hurricane warnings* average closer to two per year over some coastal segment of the United States. The economic aspects of these warnings are discussed by Sugg (90) and Neumann (68).

Table 7 further shows that 56 major hurricanes (category 3 or higher) have affected the United States between 1899 and 1980. Thus, *major* hurricanes, capable of causing damage in the billions of dollars and killing hundreds of people, have crossed the United States coastline about twice every three years.

9. ACKNOWLEDGMENTS

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APPENDIX A

Chart Series A

Tracks of North Atlantic Tropical Cyclones By Years, 1871–1980

1871–1885	Tracks only, no intensity
1886–1898	Maximum intensity (tropical storm or hurricane) only.
1899–1950	Tropical depression (dissipation stage only), tropical storm, hurricane or extratropical storm
1951–1967	Tropical depression, tropical storm, hurricane or extratropical storm
1968–1980	Tropical depression, tropical storm, hurricane, extratropical storm, subtropical depression, subtropical storm

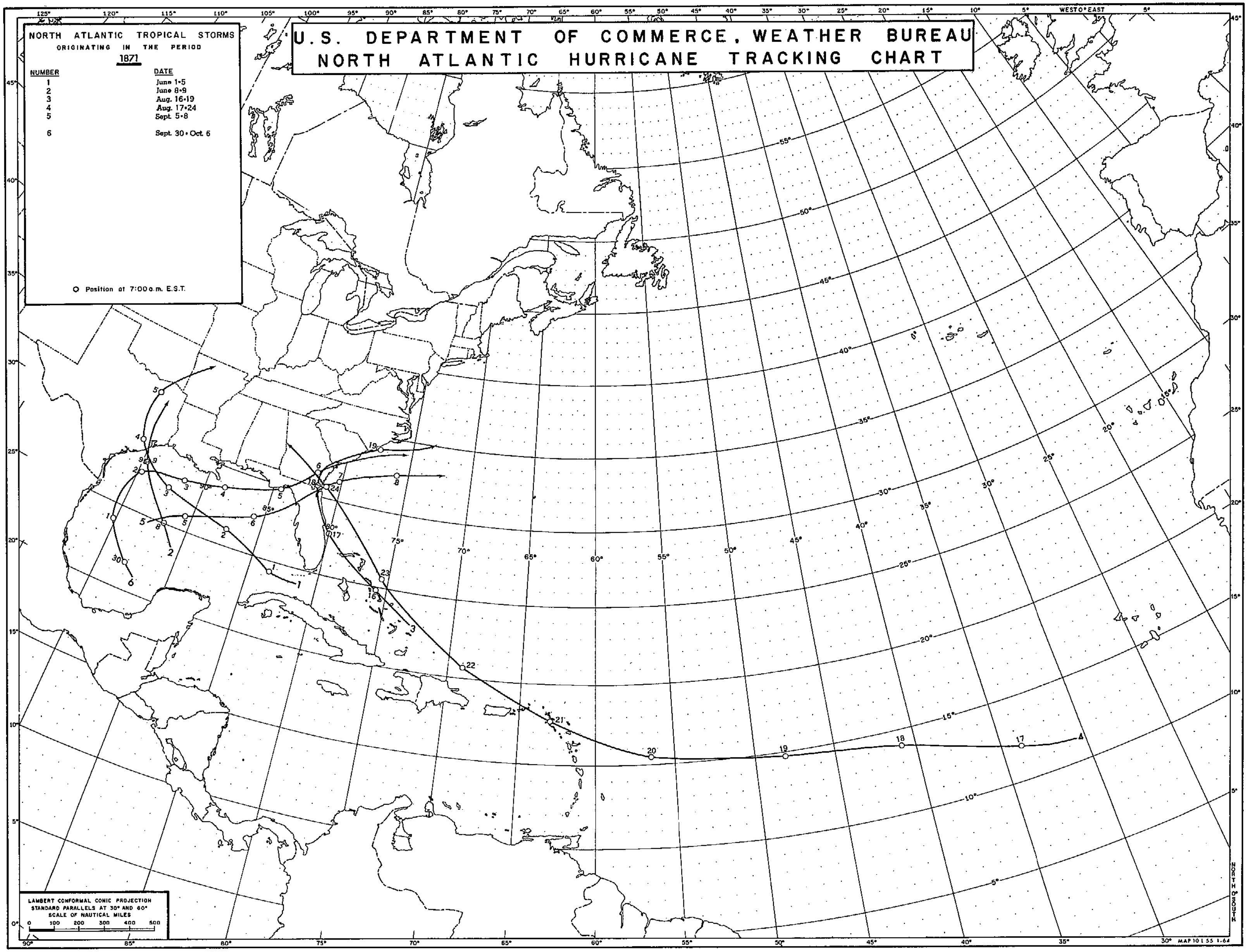
(See table 1 for definitions of various stages)

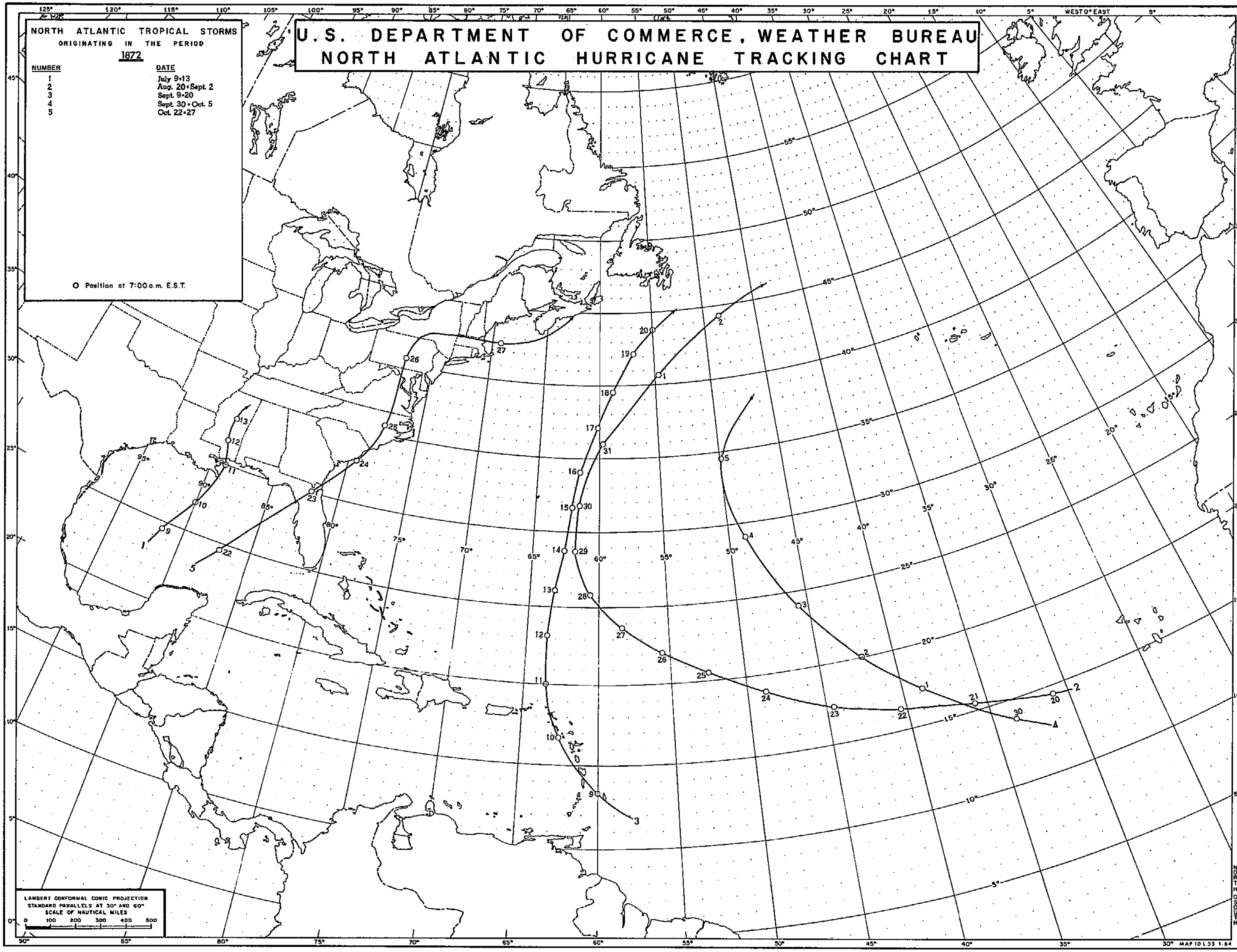
Note: Six blank pages have been provided for attaching track charts for the years 1981 through 1986. These charts (for the preceding hurricane season) are normally published in the April issue of the Monthly Weather Review (108).

APPENDIX B

Chart Series B

Tracks of North Atlantic Tropical Cyclones by months, May through December, and by 10- (or 11-) day periods, June 1 through November 30, 1886 through 1980


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1871
NUMBER
DATE
1 June 1-5
2 June 8-9
3 Aug. 16-19
4 Aug. 17-24
5 Sept. 5-8
6 Sept. 30 - Oct. 6
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 1 55 1.64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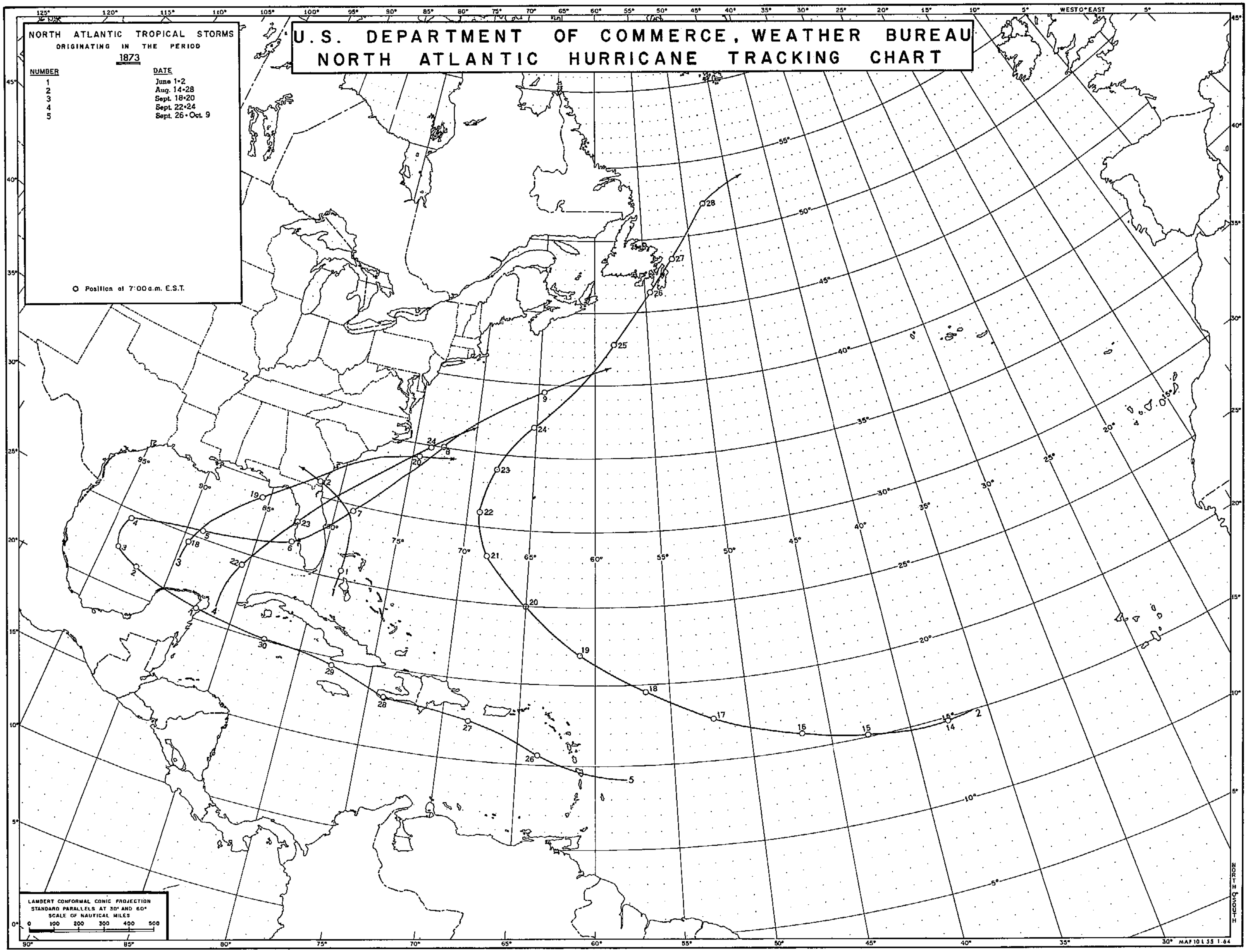
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1872
NUMBER DATE
1 July 9-13
2 Aug. 20-Sept. 2
3 Sept. 9-20
4 Sept. 30-Oct. 5
5 Oct. 22-27
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500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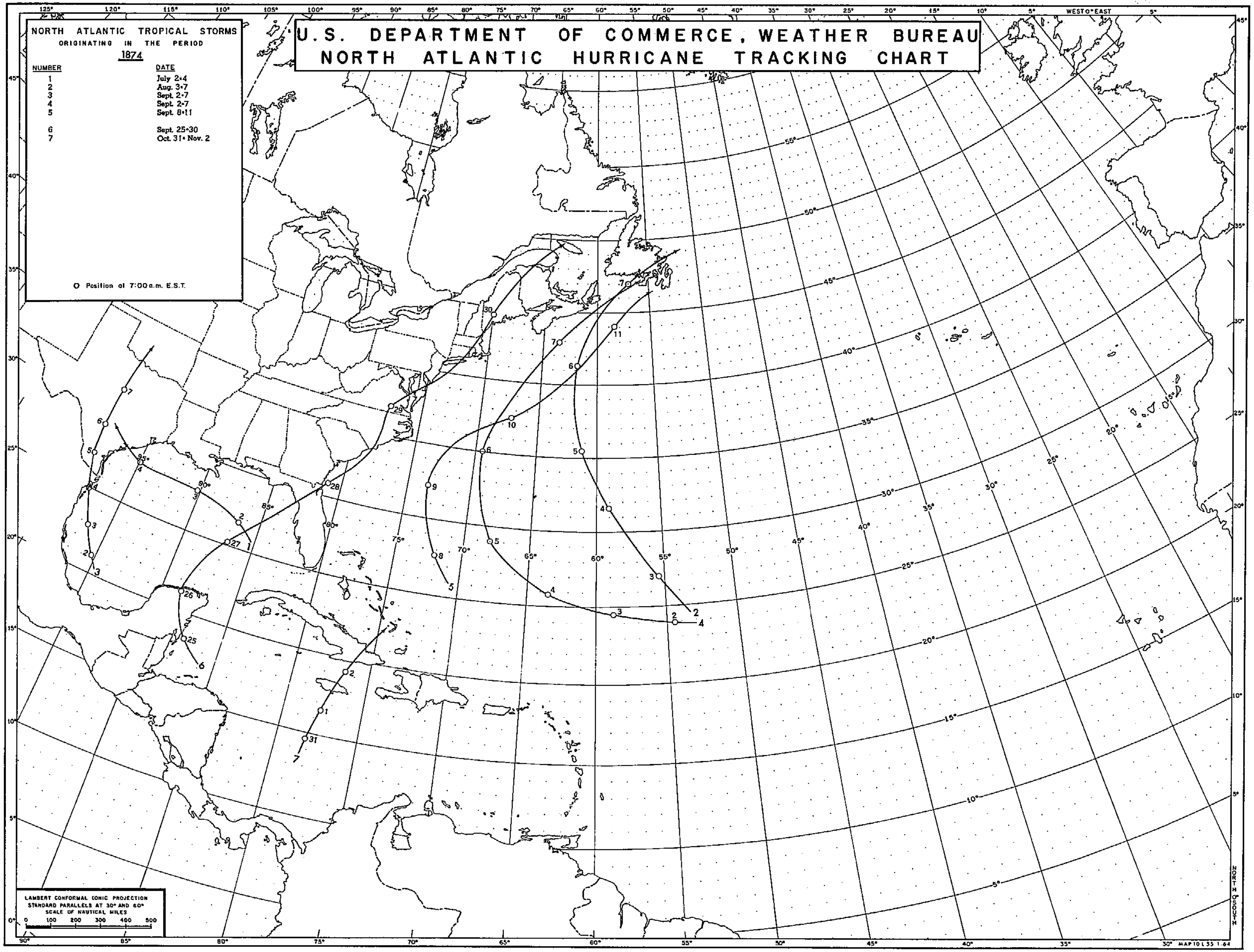
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1873
NUMBER
DATE
1 June 1-2
2 Aug. 14-28
3 Sept. 18-20
4 Sept. 22-24
5 Sept. 26 - Oct. 9
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500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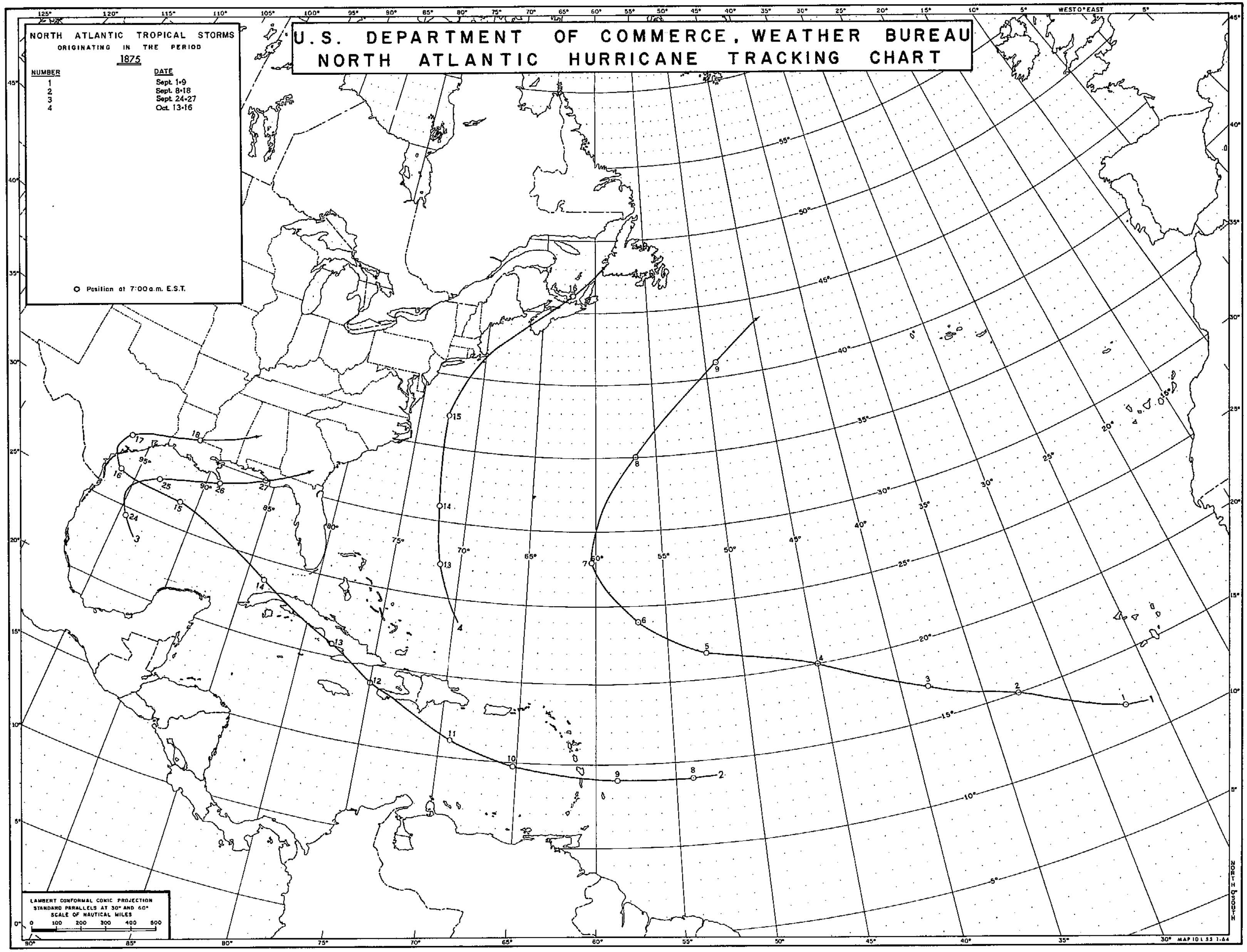
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1874
NUMBER
DATE
1 July 2-4
2 Aug. 3-7
3 Sept. 2-7
4 Sept. 2-7
5 Sept. 8-11
6 Sept. 25-30
7 Oct. 31- Nov. 2
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500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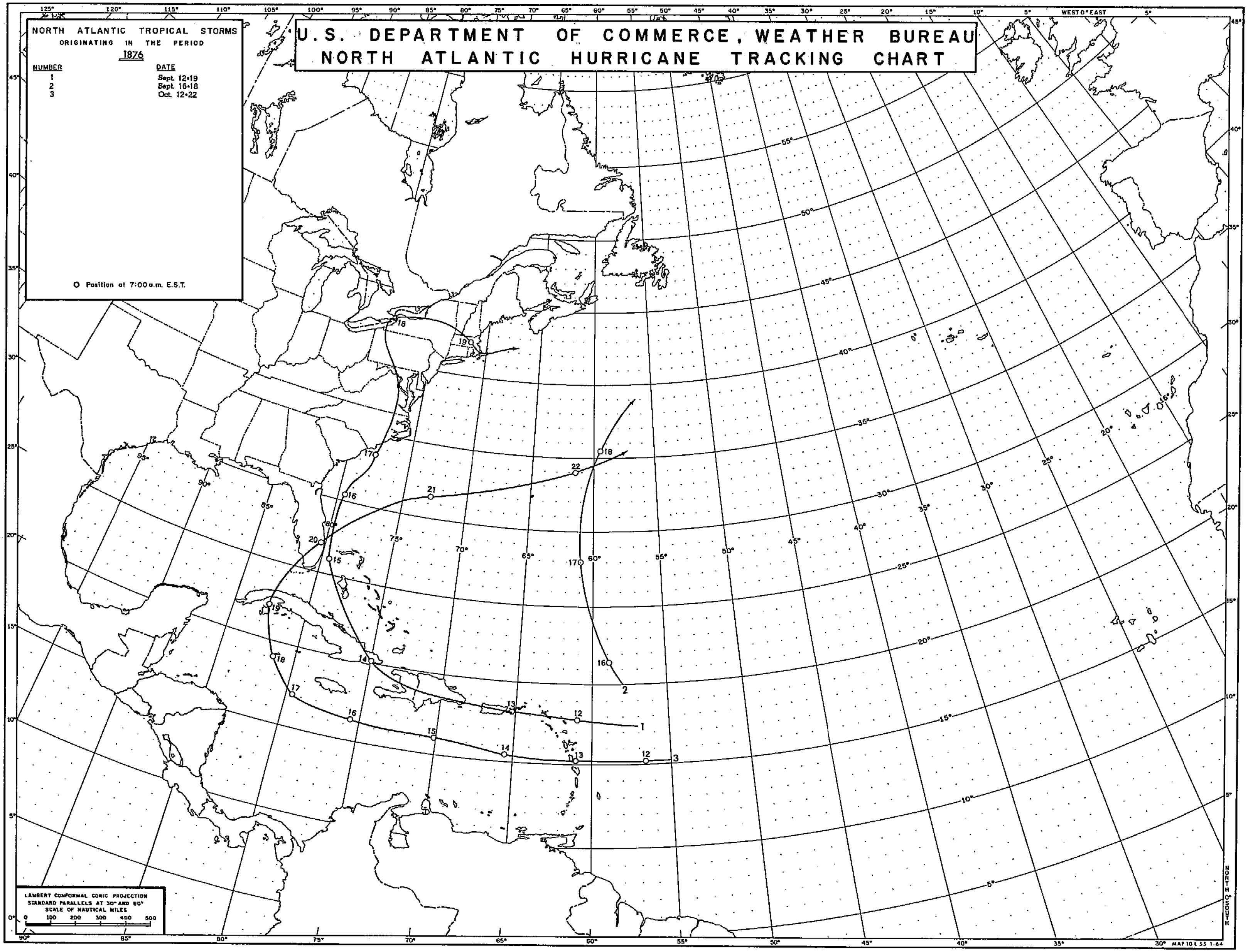
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1875
NUMBER
DATE
1 Sept. 1-9
2 Sept. 8-18
3 Sept. 24-27
4 Oct. 13-16
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500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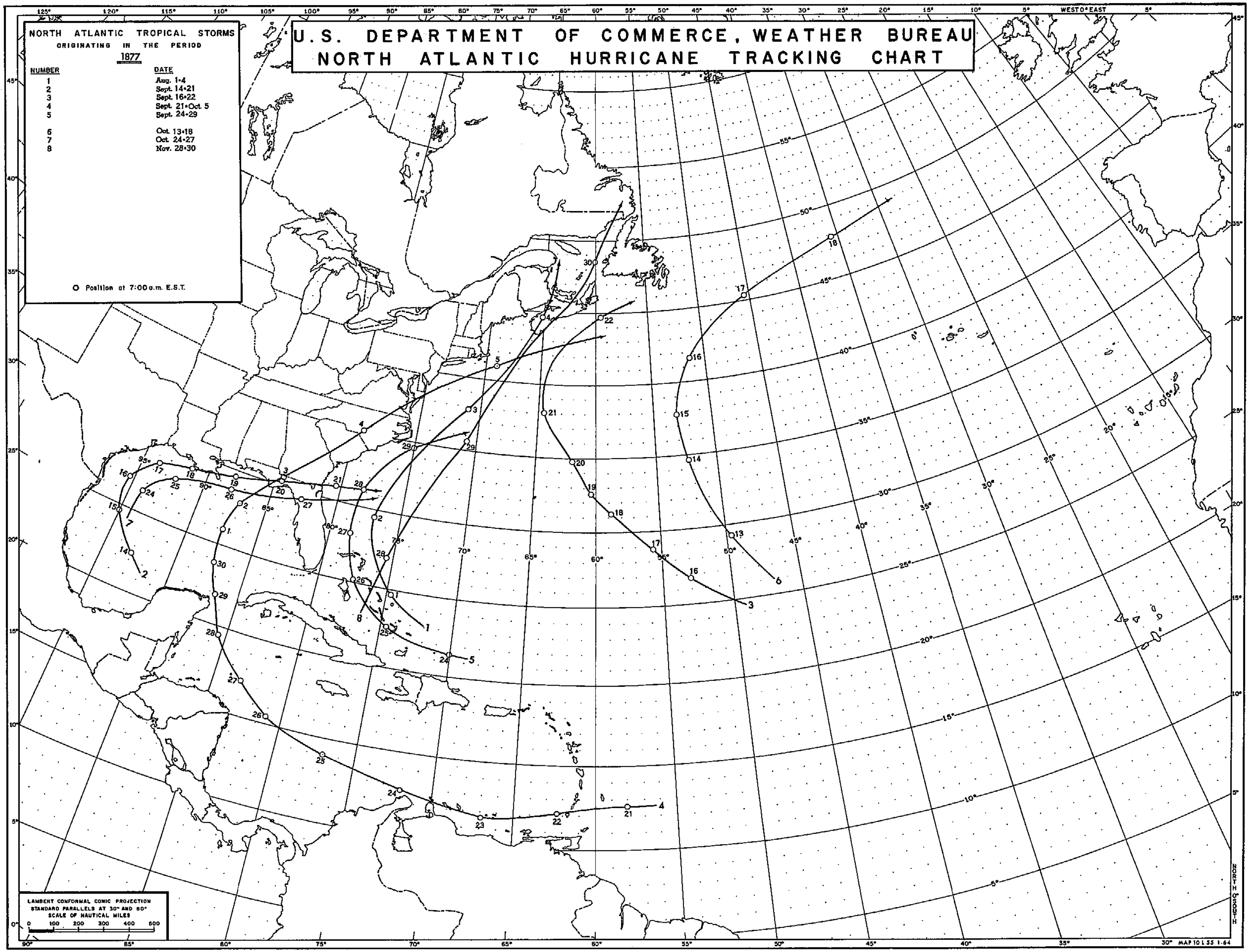
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1876
NUMBER
DATE
1 Sept. 12-19
2 Sept. 16-18
3 Oct. 12-22
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500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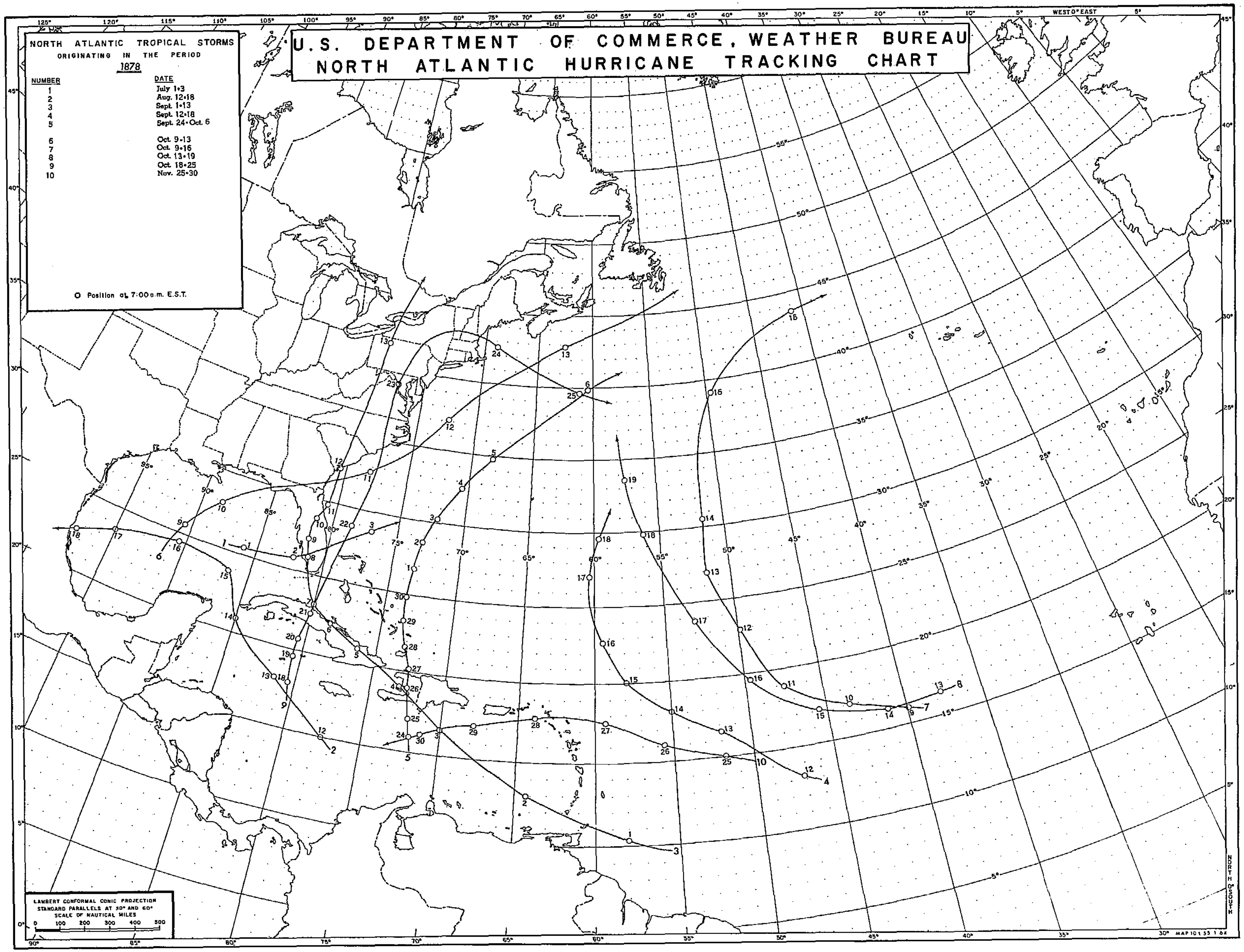
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1877
NUMBER DATE
1 Aug. 1-4
2 Sept. 14-21
3 Sept. 16-22
4 Sept. 21-Oct. 5
5 Sept. 24-29
6 Oct. 13-18
7 Oct. 24-27
8 Nov. 28-30
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
MAP 10 L SS 1-64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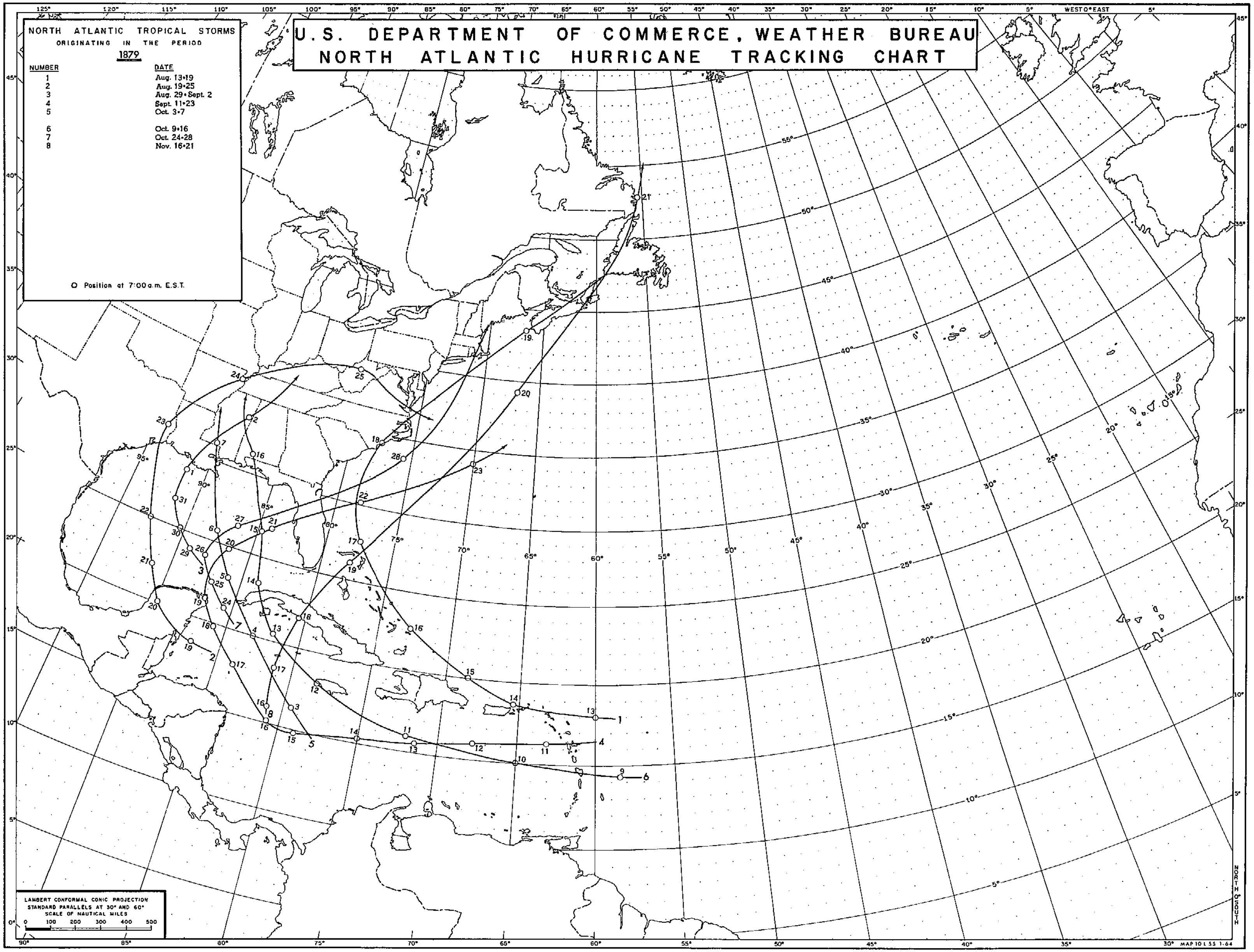
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1878
NUMBER
DATE
1 July 1-3
2 Aug. 12-18
3 Sept. 1-13
4 Sept. 12-18
5 Sept. 24-Oct. 6
6 Oct. 9-13
7 Oct. 9-16
8 Oct. 13-19
9 Oct. 18-25
10 Nov. 25-30
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES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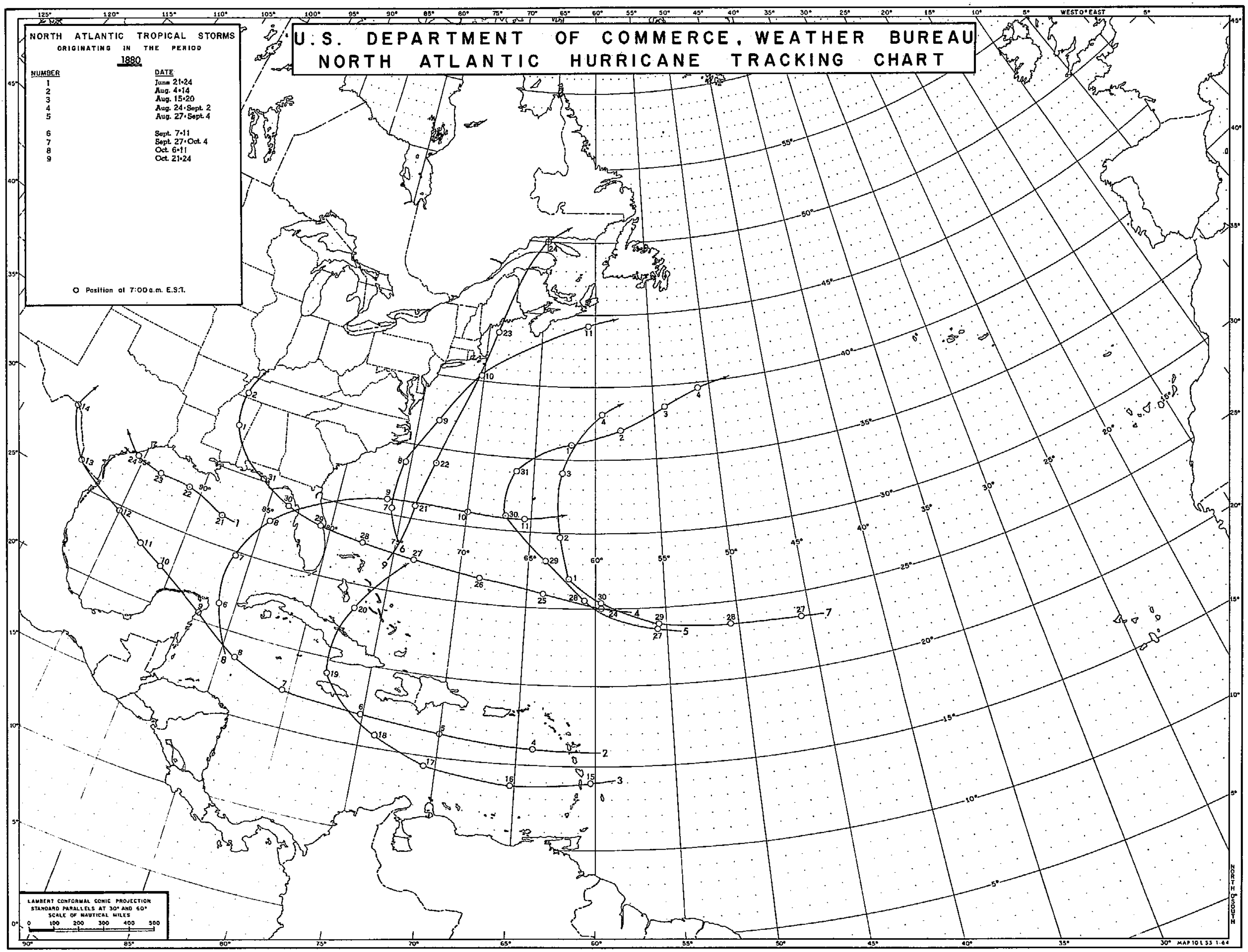
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1879
NUMBER
DATE
1 Aug. 13-19
2 Aug. 19-25
3 Aug. 29-Sept. 2
4 Sept. 11-23
5 Oct. 3-7
6 Oct. 9-16
7 Oct. 24-28
8 Nov. 16-21
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500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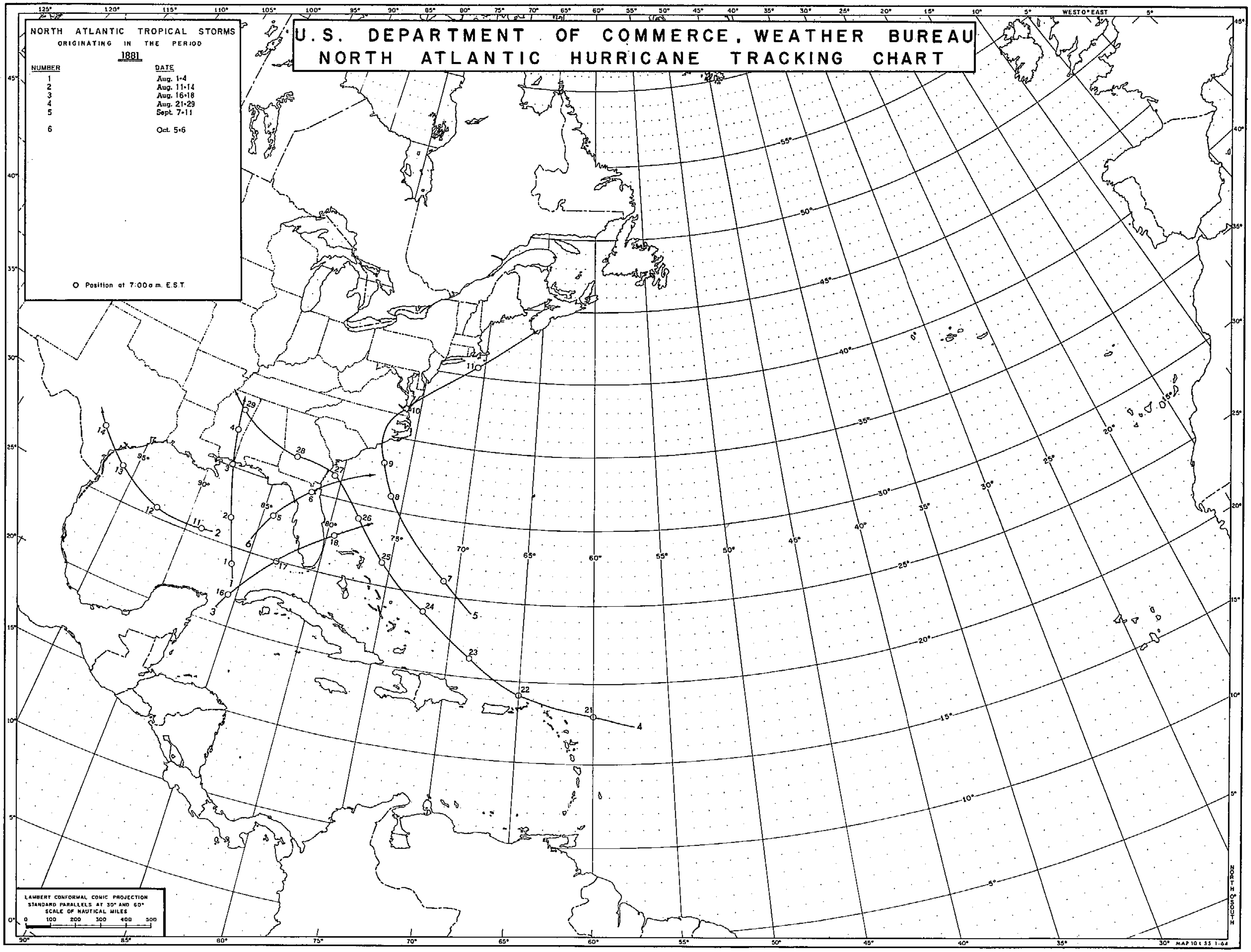
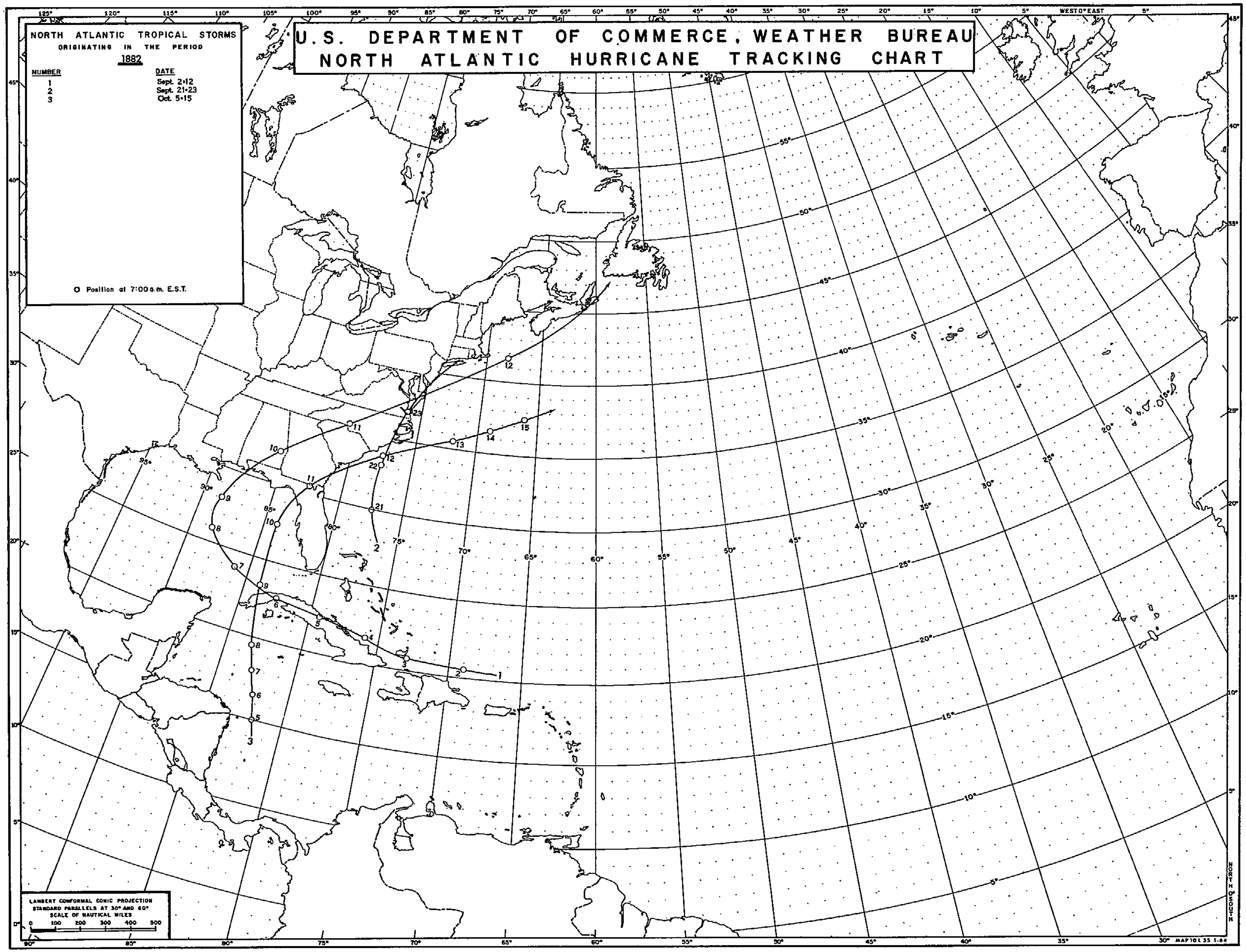
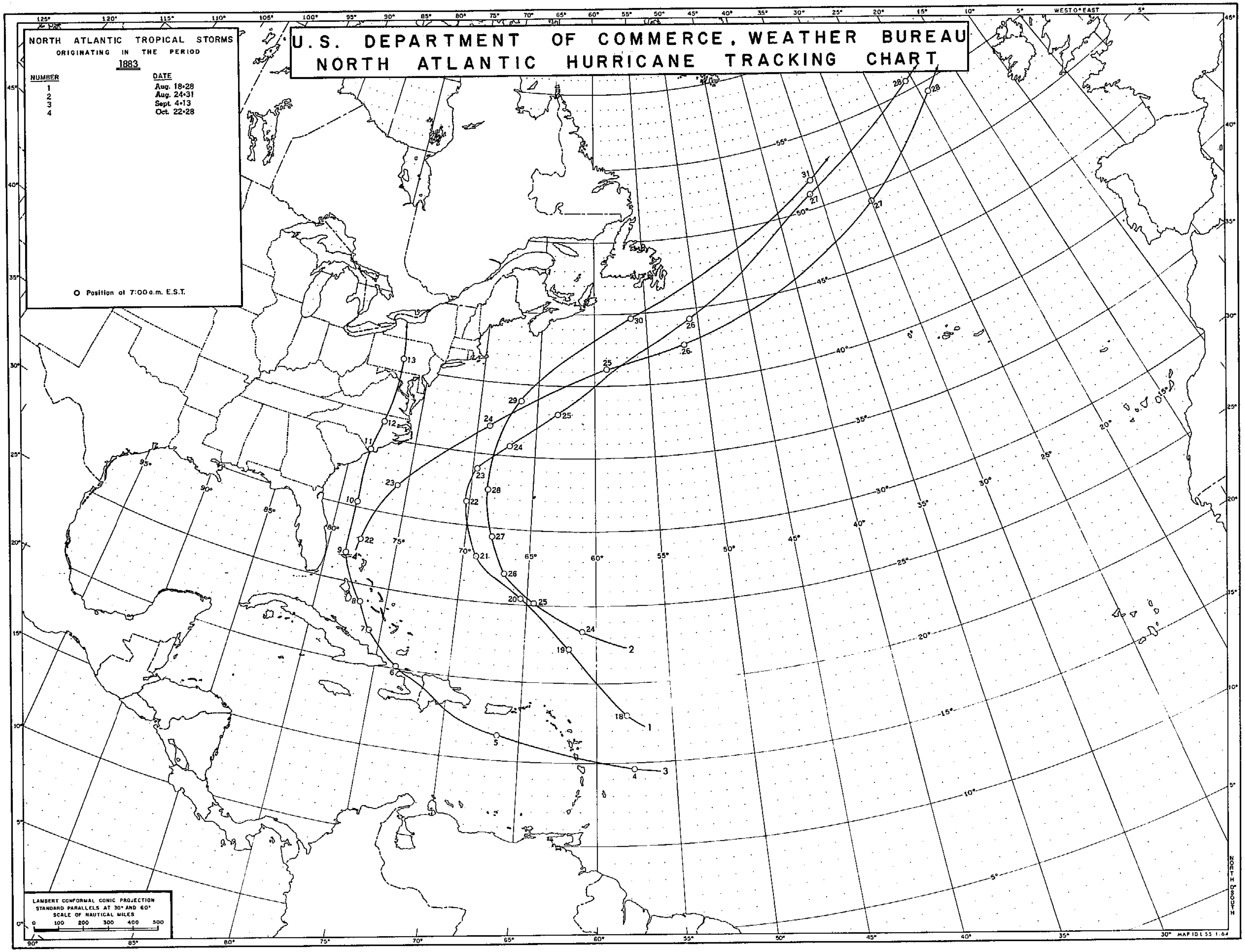
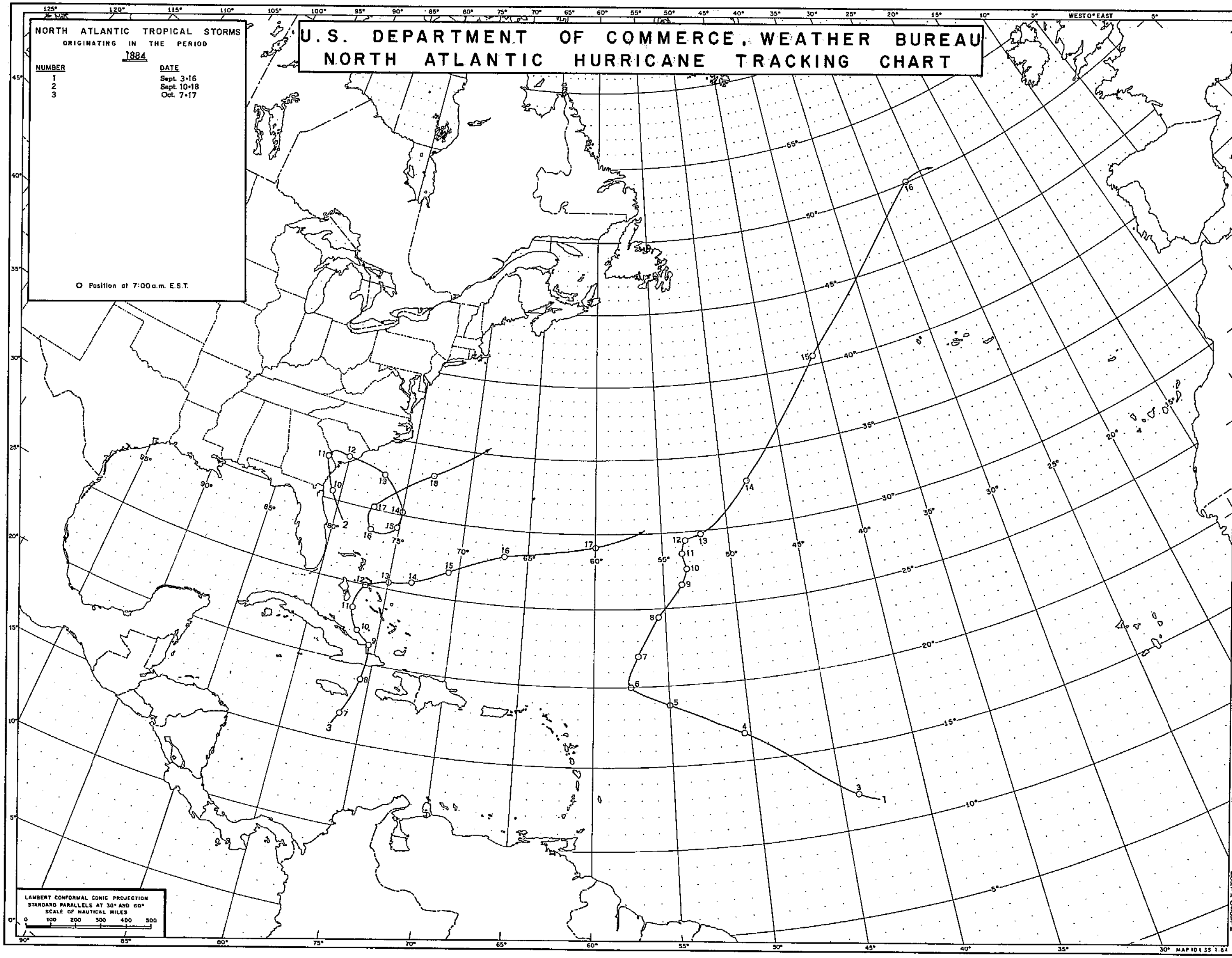
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1880
NUMBER
DATE
1 June 21-24
2 Aug. 4-14
3 Aug. 15-20
4 Aug. 24-Sept. 2
5 Aug. 27-Sept. 4
6 Sept. 7-11
7 Sept. 27-Oct. 4
8 Oct. 6-11
9 Oct. 21-24
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 3 5 1-64


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1881
NUMBER
DATE
1 Aug. 1-4
2 Aug. 11-14
3 Aug. 16-18
4 Aug. 21-29
5 Sept. 7-11
6 Oct. 5-6
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH 0° SOUTH
WEST 0° EAST

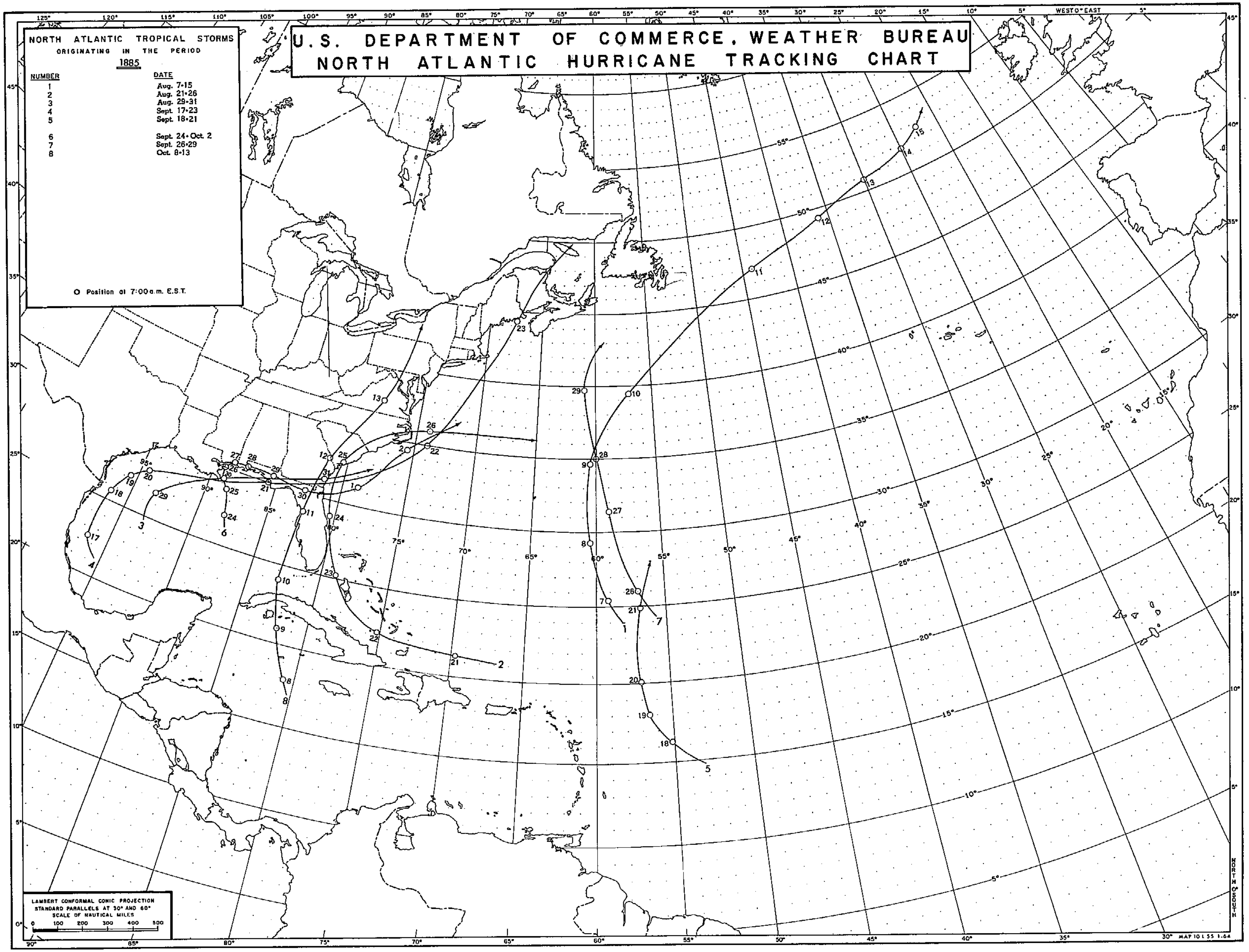


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1882
NUMBER
DATE
1
Sept. 2-12
2
Sept. 21-23
3
Oct. 5-15
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

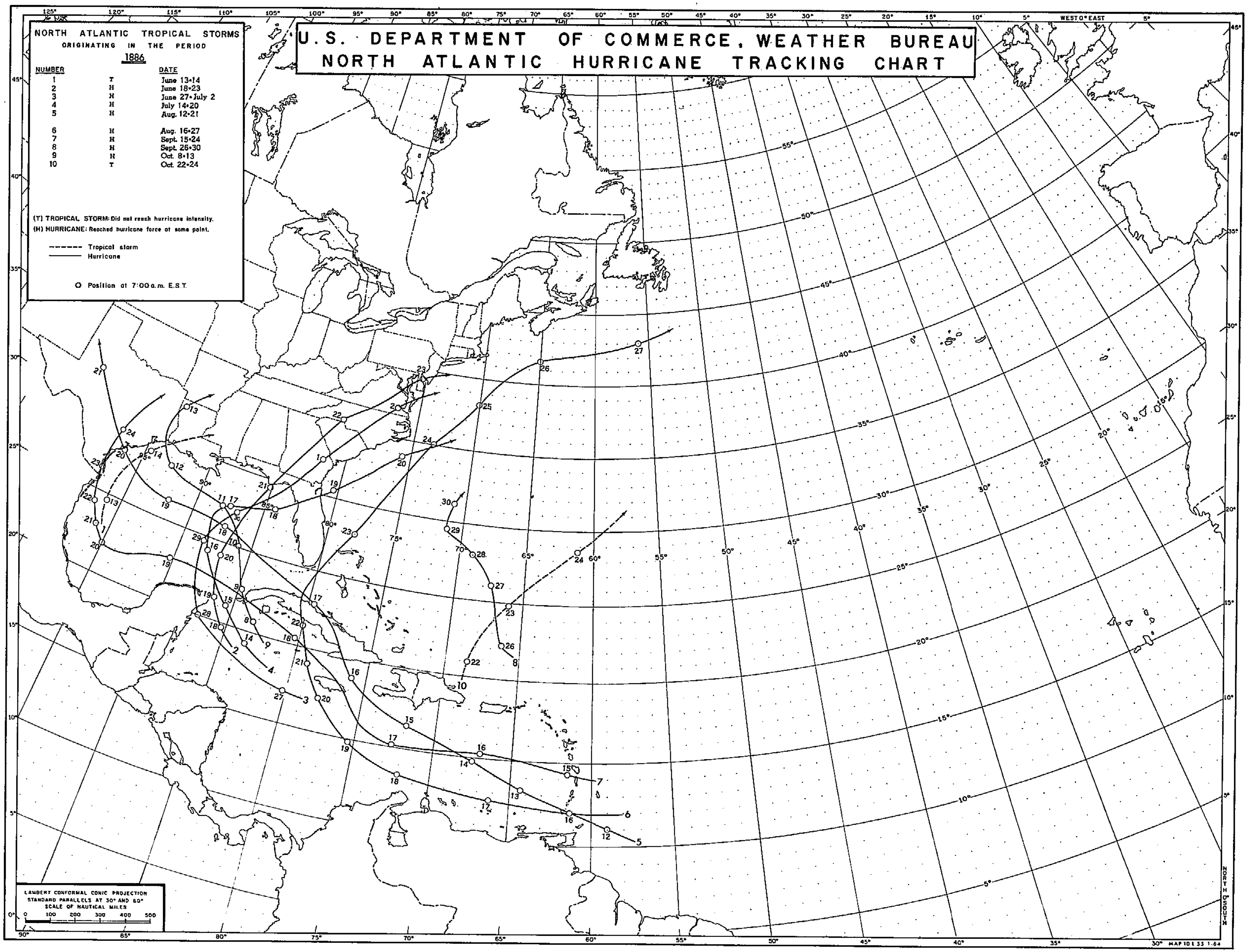

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1883
NUMBER
DATE
1 Aug. 18-28
2 Aug. 24-31
3 Sept. 4-13
4 Oct. 22-28
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

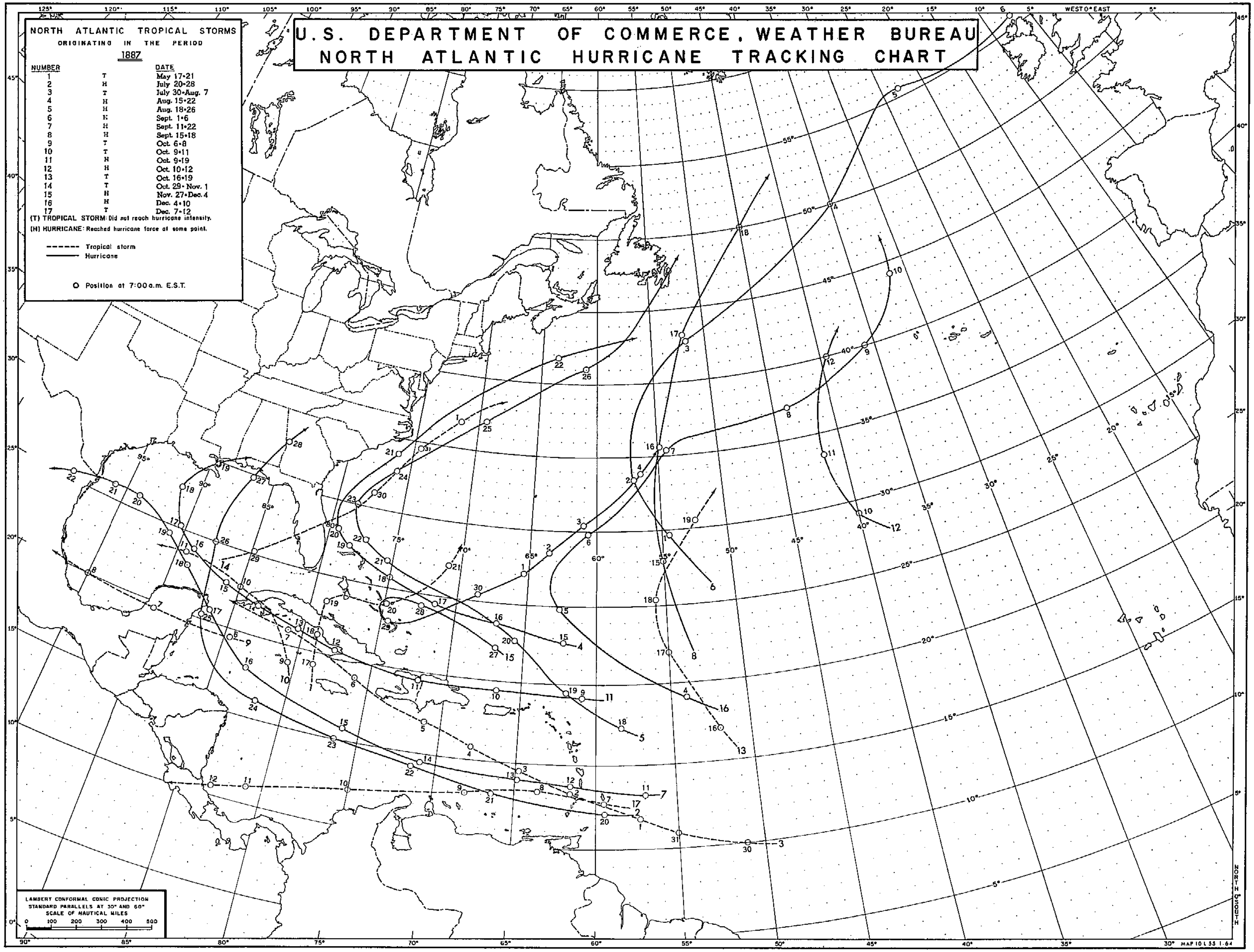


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1884
NUMBER DATE
1 Sept. 3-16
2 Sept. 10-18
3 Oct. 7-17
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 35 1-64

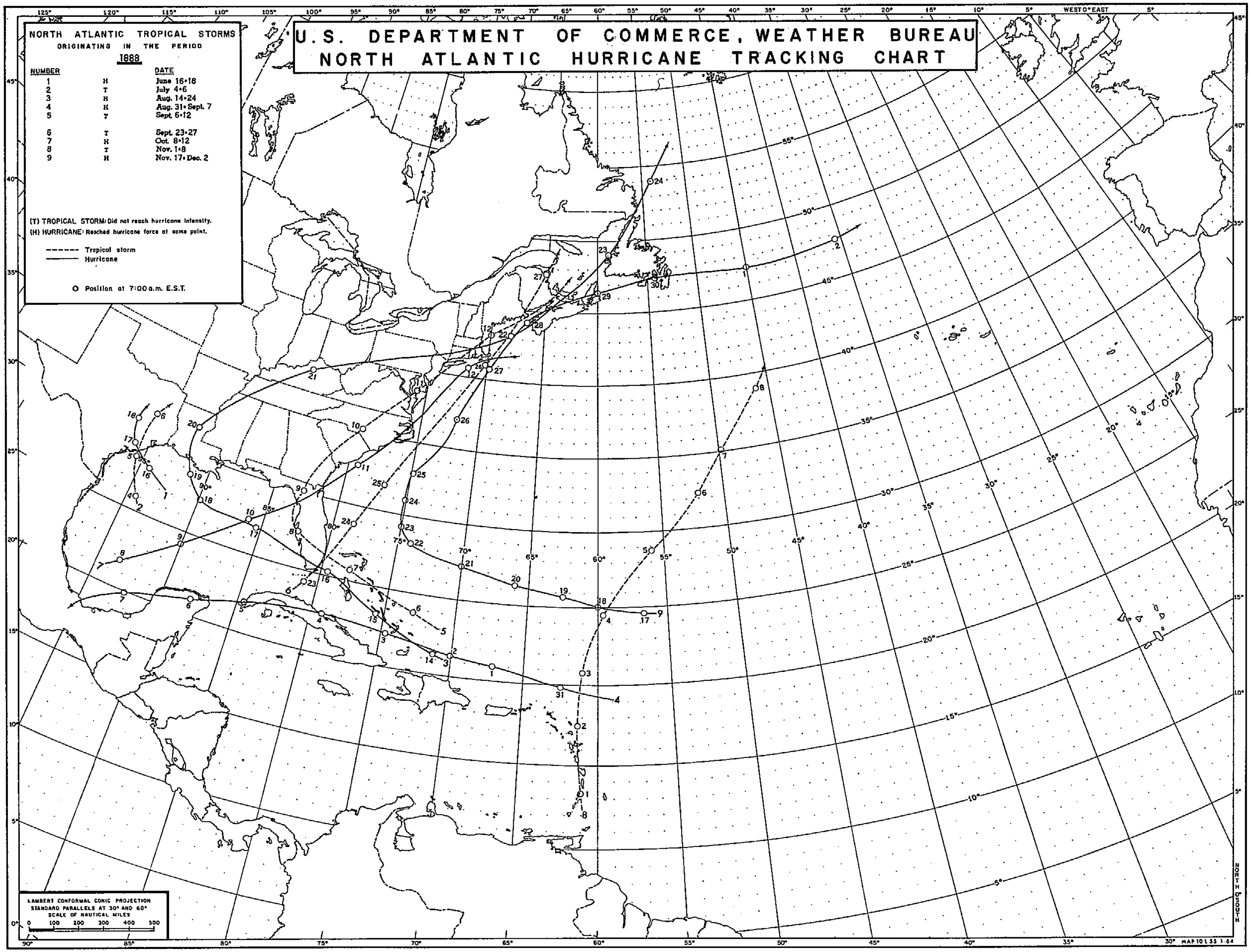


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1885
NUMBER
DATE
1 Aug. 7-15
2 Aug. 21-26
3 Aug. 29-31
4 Sept. 17-23
5 Sept. 18-21
6 Sept. 24-Oct. 2
7 Sept. 26-29
8 Oct. 8-13
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

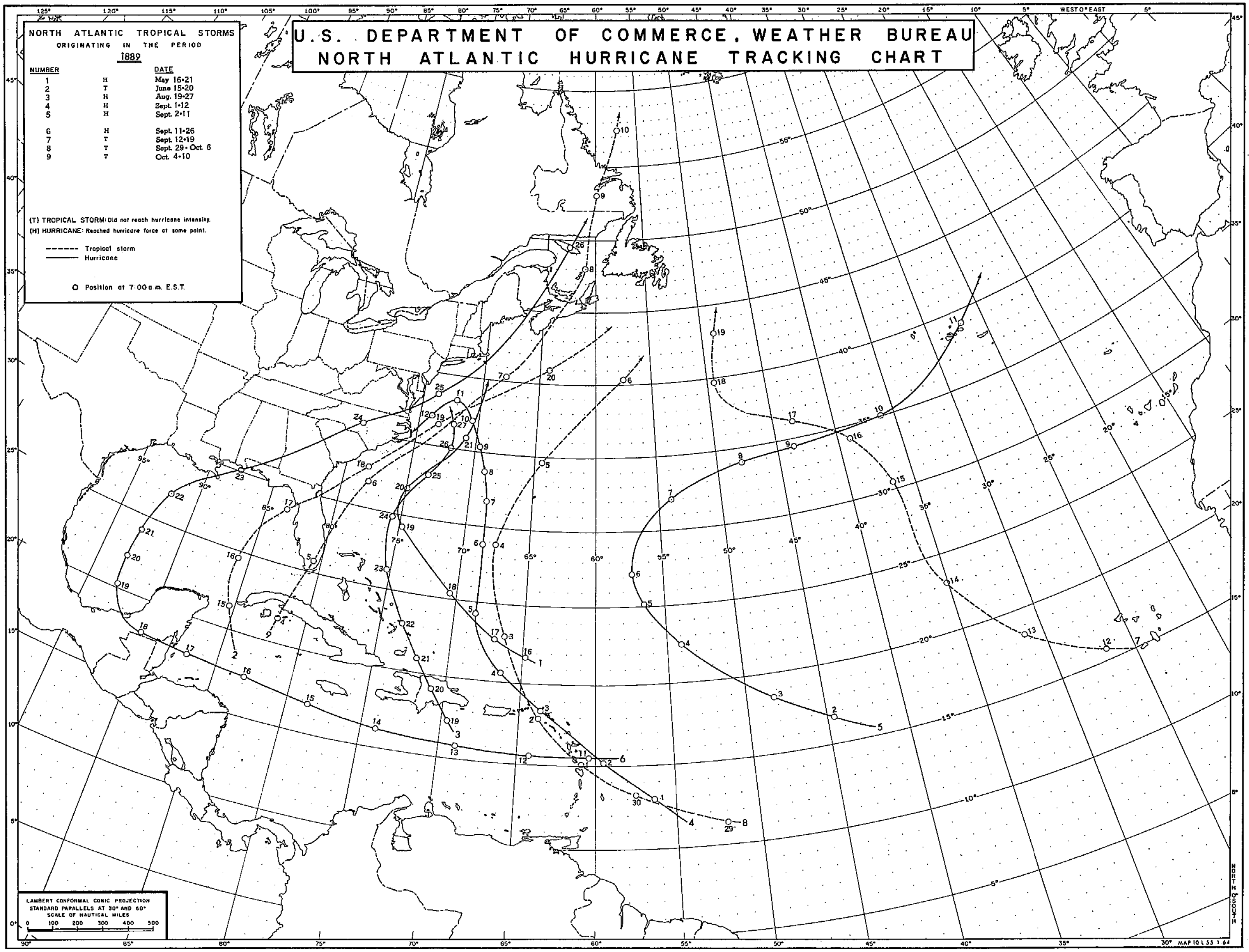

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1886
NUMBER DATE
1 T June 13-14
2 H June 18-23
3 H June 27-July 2
4 H July 14-20
5 H Aug. 12-21
6 H Aug. 16-27
7 H Sept. 15-24
8 H Sept. 26-30
9 H Oct. 8-13
10 T Oct. 22-24
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

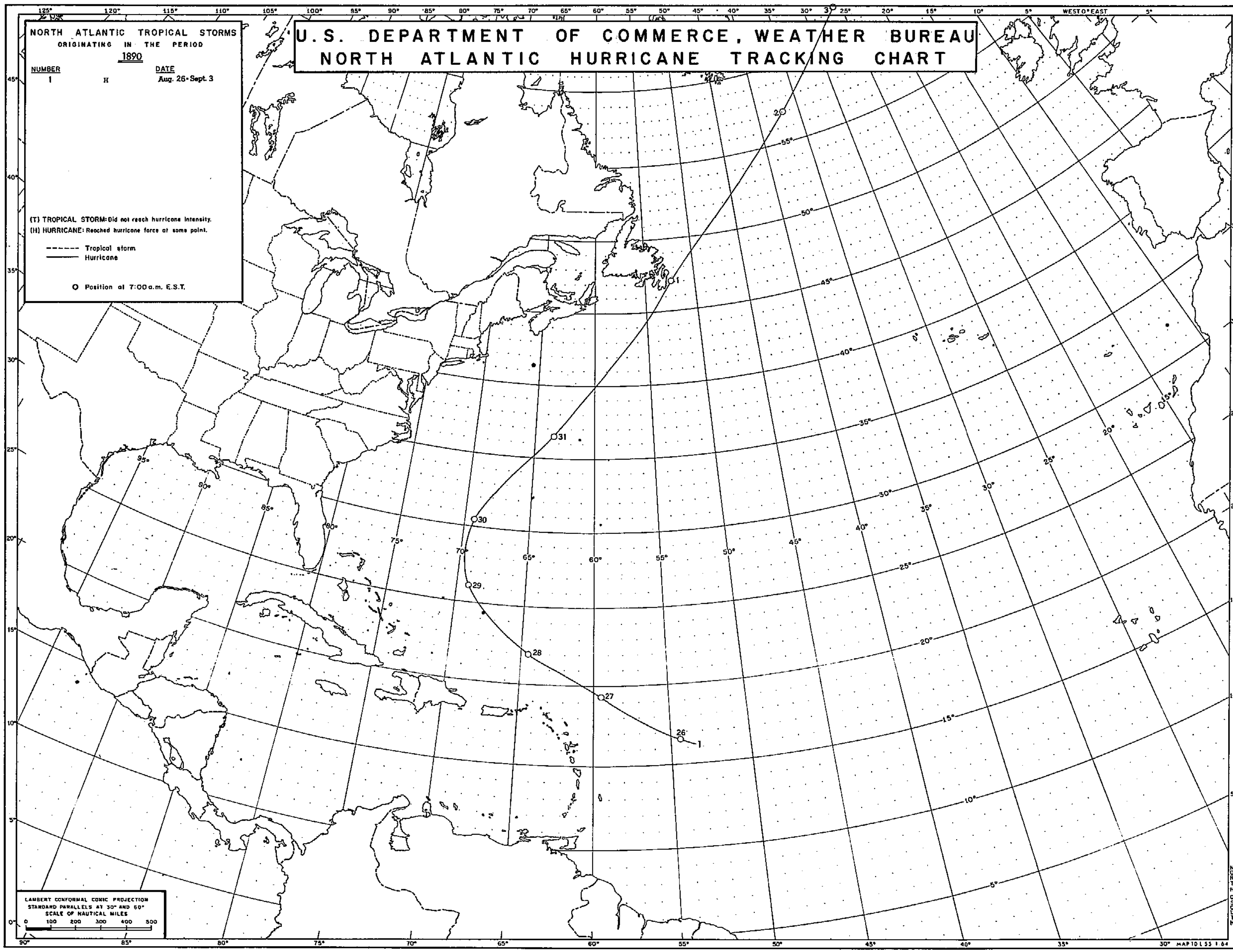


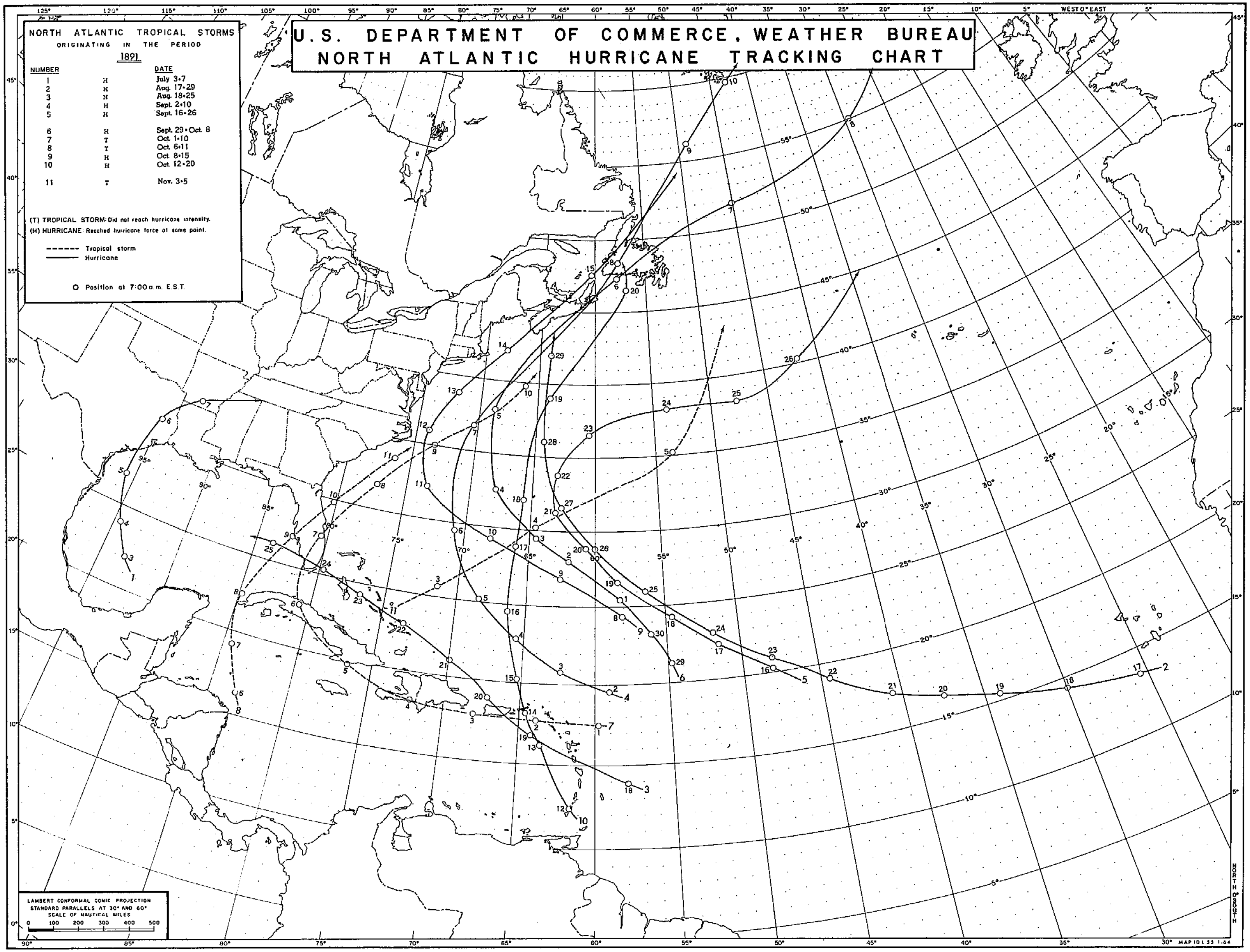
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1887
NUMBER DATE
1 T May 17-21
2 H July 20-28
3 T July 30-Aug. 7
4 H Aug. 15-22
5 H Aug. 18-26
6 H Sept. 1-6
7 H Sept. 11-22
8 H Sept. 15-18
9 T Oct. 6-8
10 T Oct. 9-11
11 H Oct. 9-19
12 H Oct. 10-12
13 T Oct. 16-19
14 T Oct. 29-Nov. 1
15 H Nov. 27-Dec. 4
16 H Dec. 4-10
17 T Dec. 7-12
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

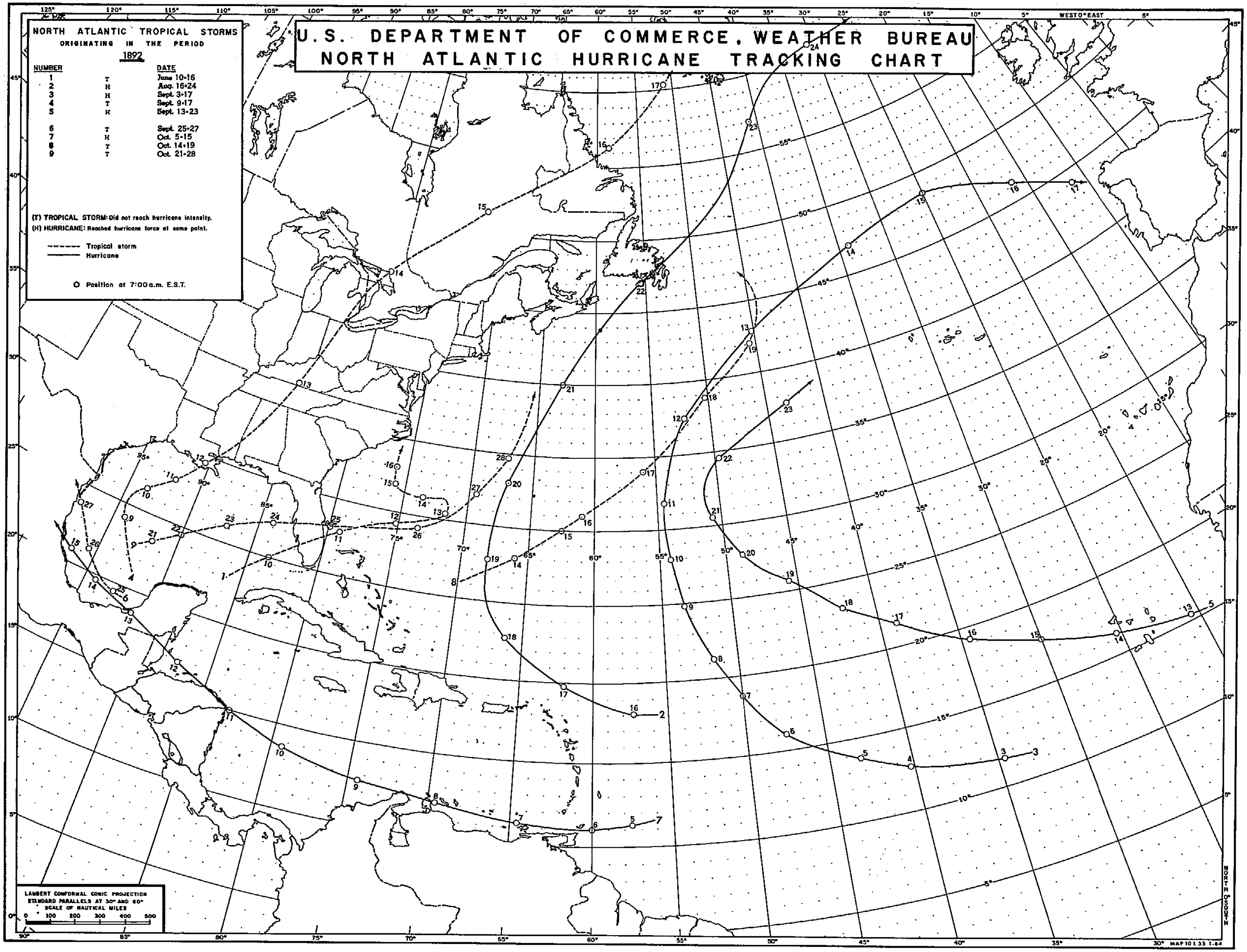


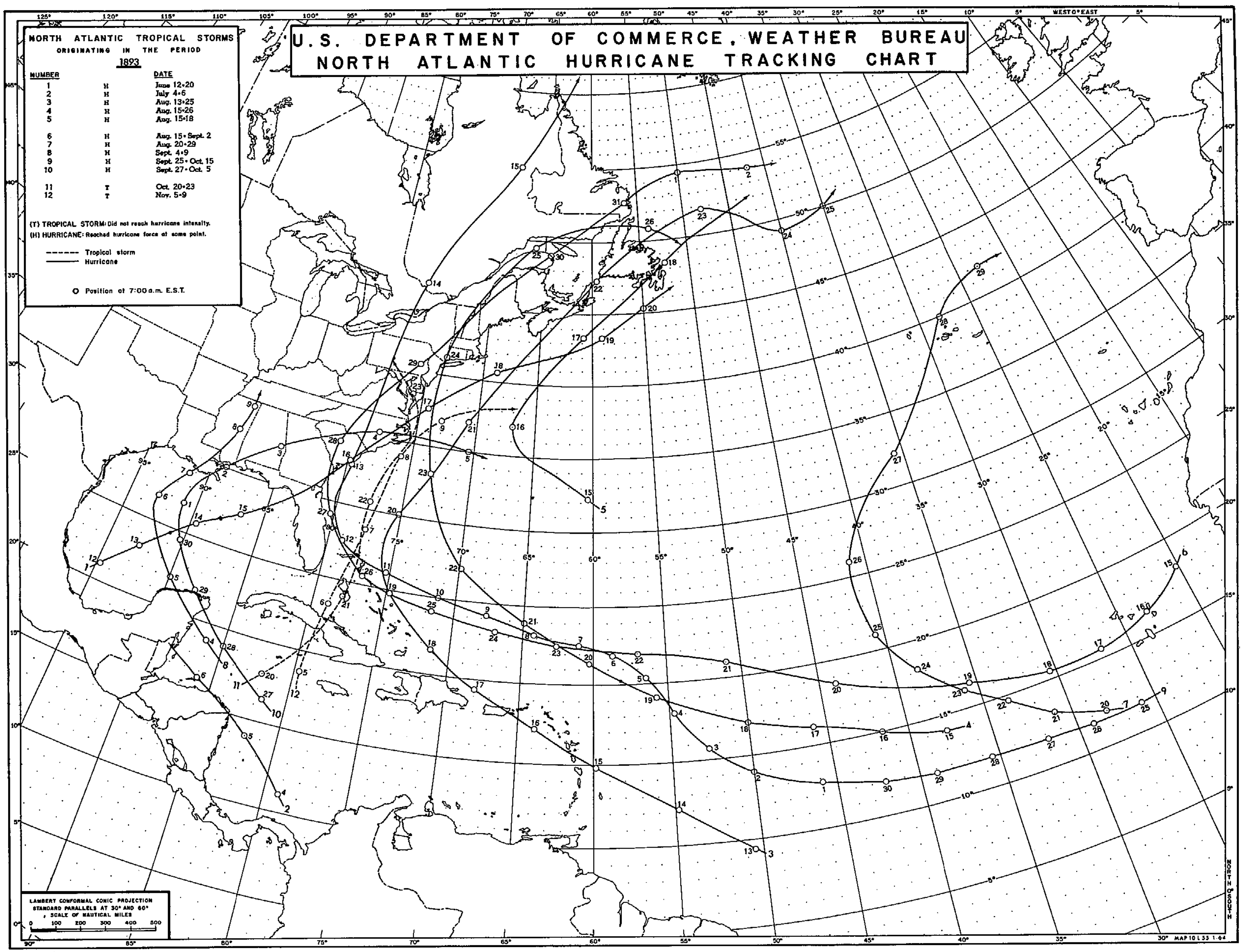
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1888
NUMBER DATE
1 H June 16-18
2 T July 4-6
3 H Aug. 14-24
4 H Aug. 31-Sept. 7
5 T Sept. 6-12
6 T Sept. 23-27
7 H Oct. 8-12
8 T Nov. 1-8
9 H Nov. 17-Dec. 2
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

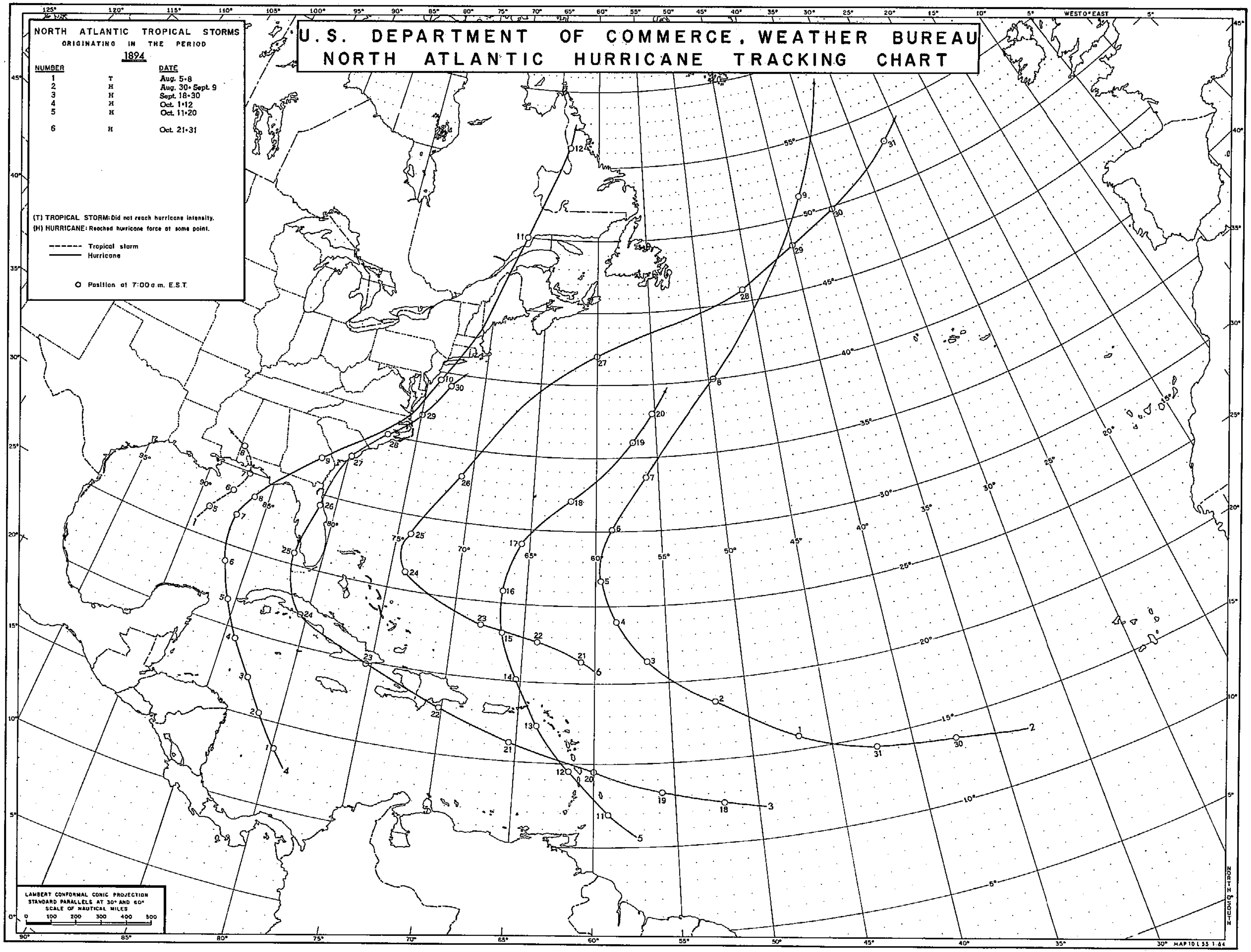

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1889
NUMBER
DATE
1 H May 16-21
2 T June 15-20
3 H Aug. 19-27
4 H Sept. 1-12
5 H Sept. 2-11
6 H Sept. 11-26
7 T Sept. 12-19
8 T Sept. 29 - Oct. 6
9 T Oct. 4-10
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
NORTH-SOUTH
WEST-EAST


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1890
NUMBER
DATE
1
H
Aug. 26-Sept. 3
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

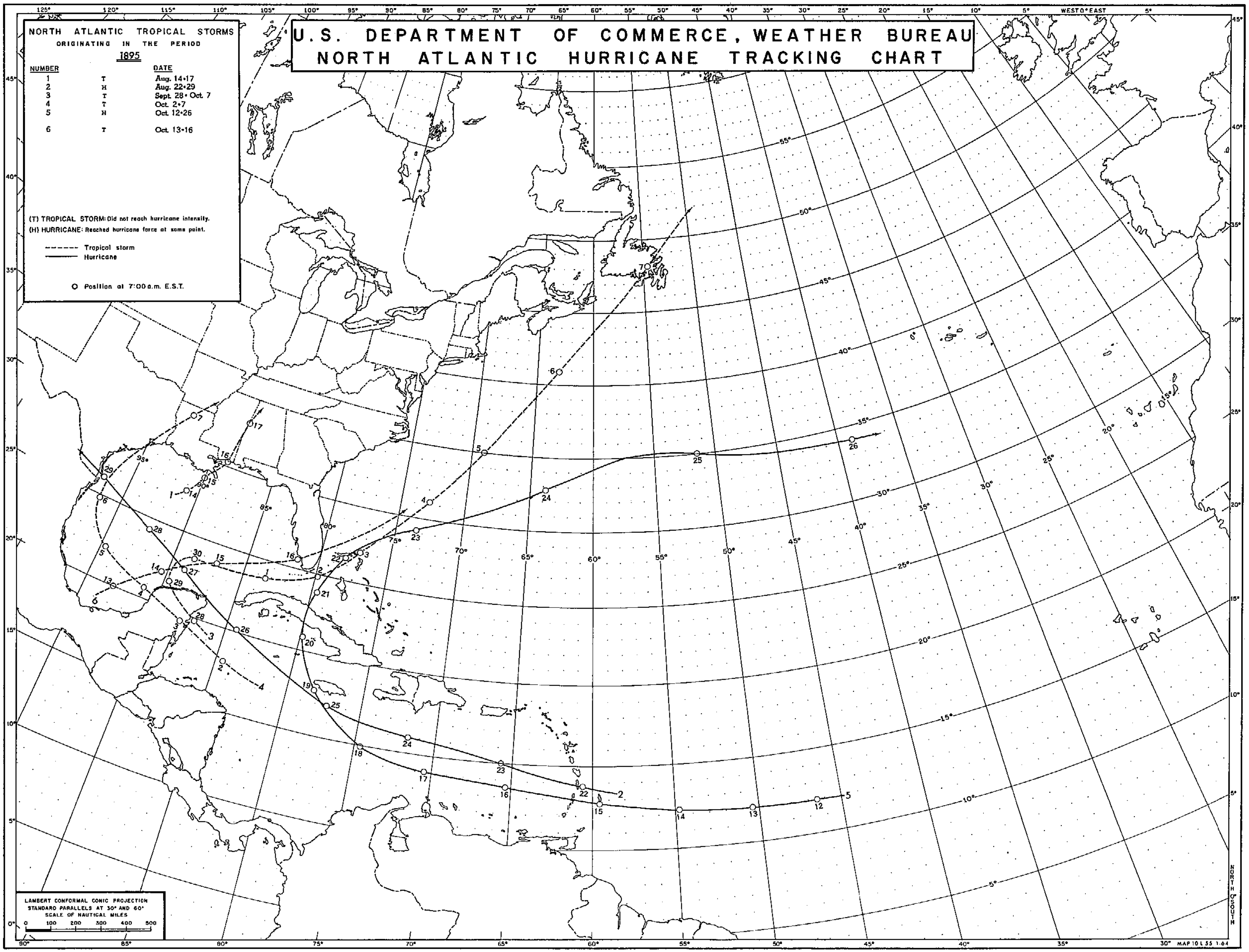

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1891
NUMBER
DATE
1 H July 3-7
2 H Aug. 17-29
3 H Aug. 18-25
4 H Sept. 2-10
5 H Sept. 16-26
6 H Sept. 29-Oct. 8
7 T Oct. 1-10
8 T Oct. 6-11
9 H Oct. 8-15
10 H Oct. 12-20
11 T Nov. 3-5
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

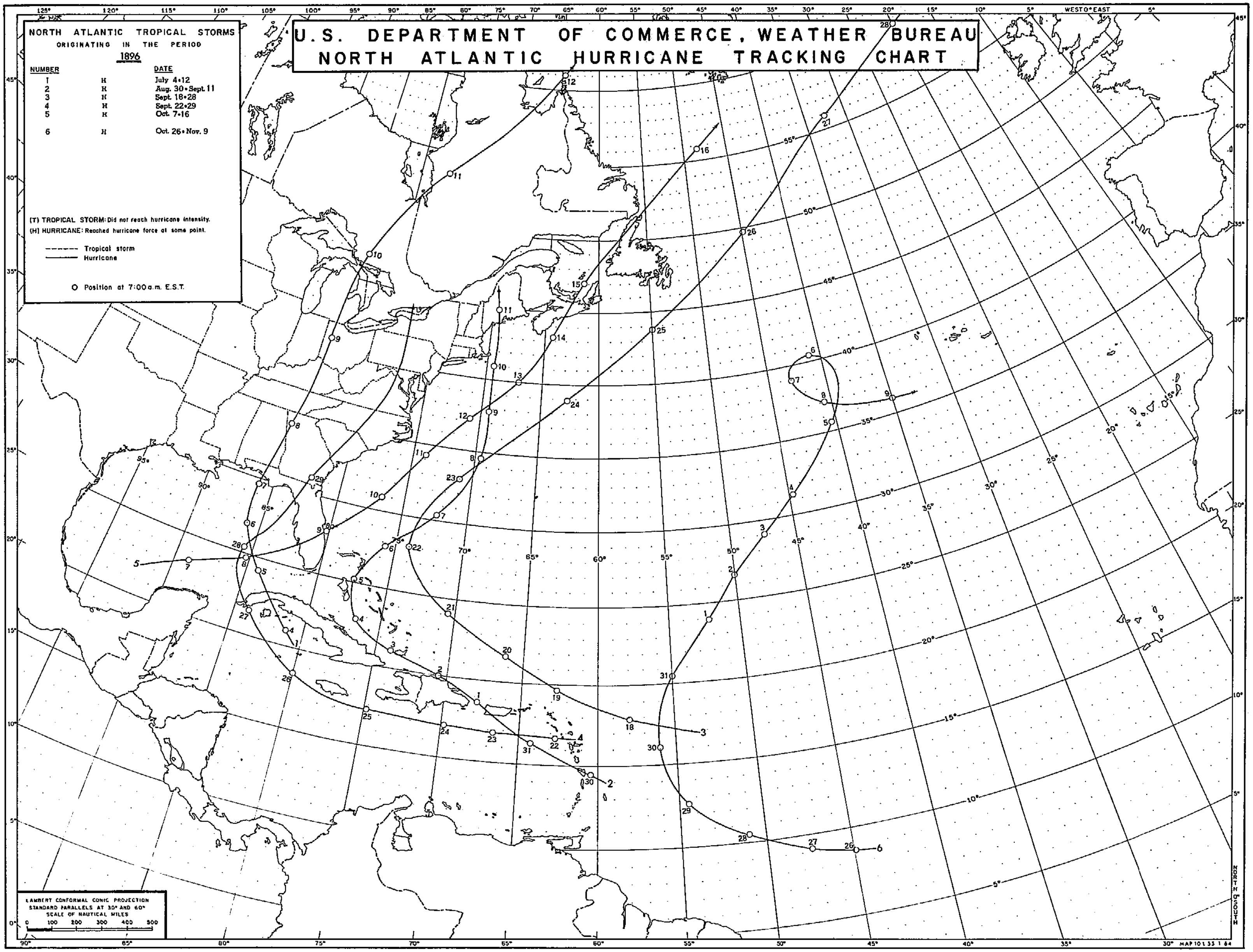

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1892
NUMBER DATE
1 T June 10-16
2 H Aug. 16-24
3 H Sept. 3-17
4 T Sept. 9-17
5 H Sept. 13-23
6 T Sept. 25-27
7 H Oct. 5-15
8 T Oct. 14-19
9 T Oct. 21-28
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 35 1-64

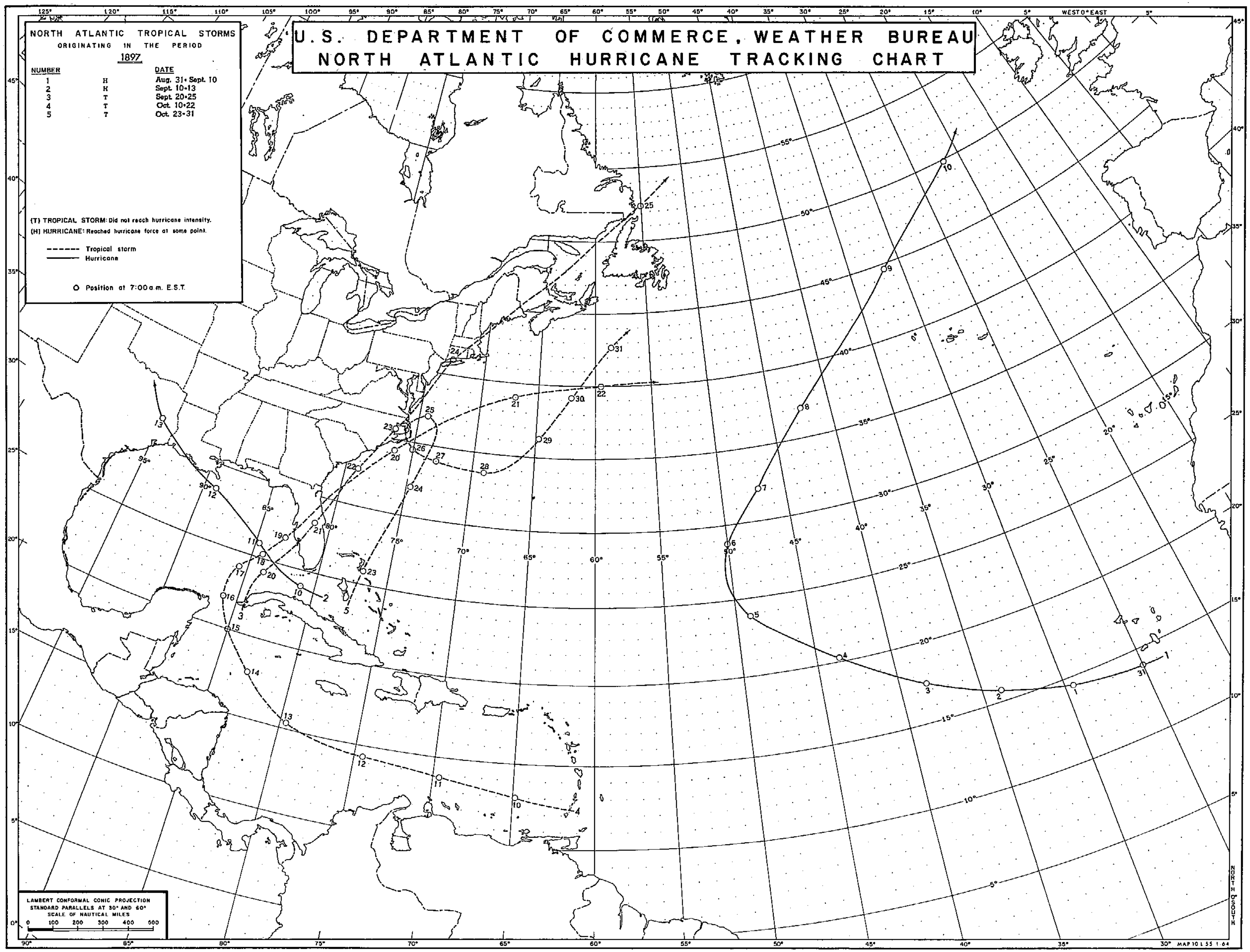

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1893
NUMBER DATE
1 H June 12-20
2 H July 4-6
3 H Aug. 13-25
4 H Aug. 15-26
5 H Aug. 15-18
6 H Aug. 15-Sept. 2
7 H Aug. 20-29
8 H Sept. 4-9
9 H Sept. 25-Oct. 15
10 H Sept. 27-Oct. 5
11 T Oct. 20-23
12 T Nov. 5-9
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 33 1-64

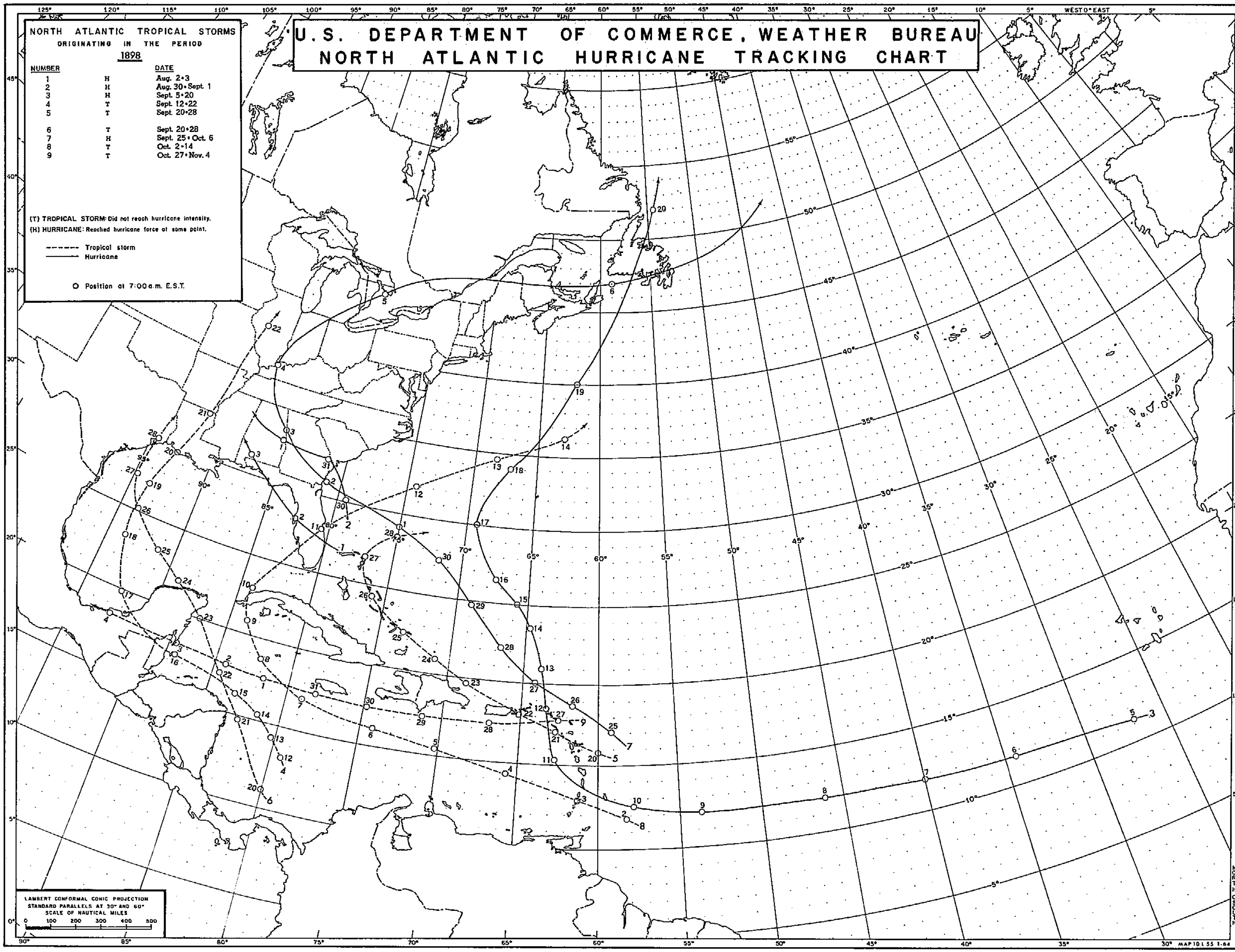


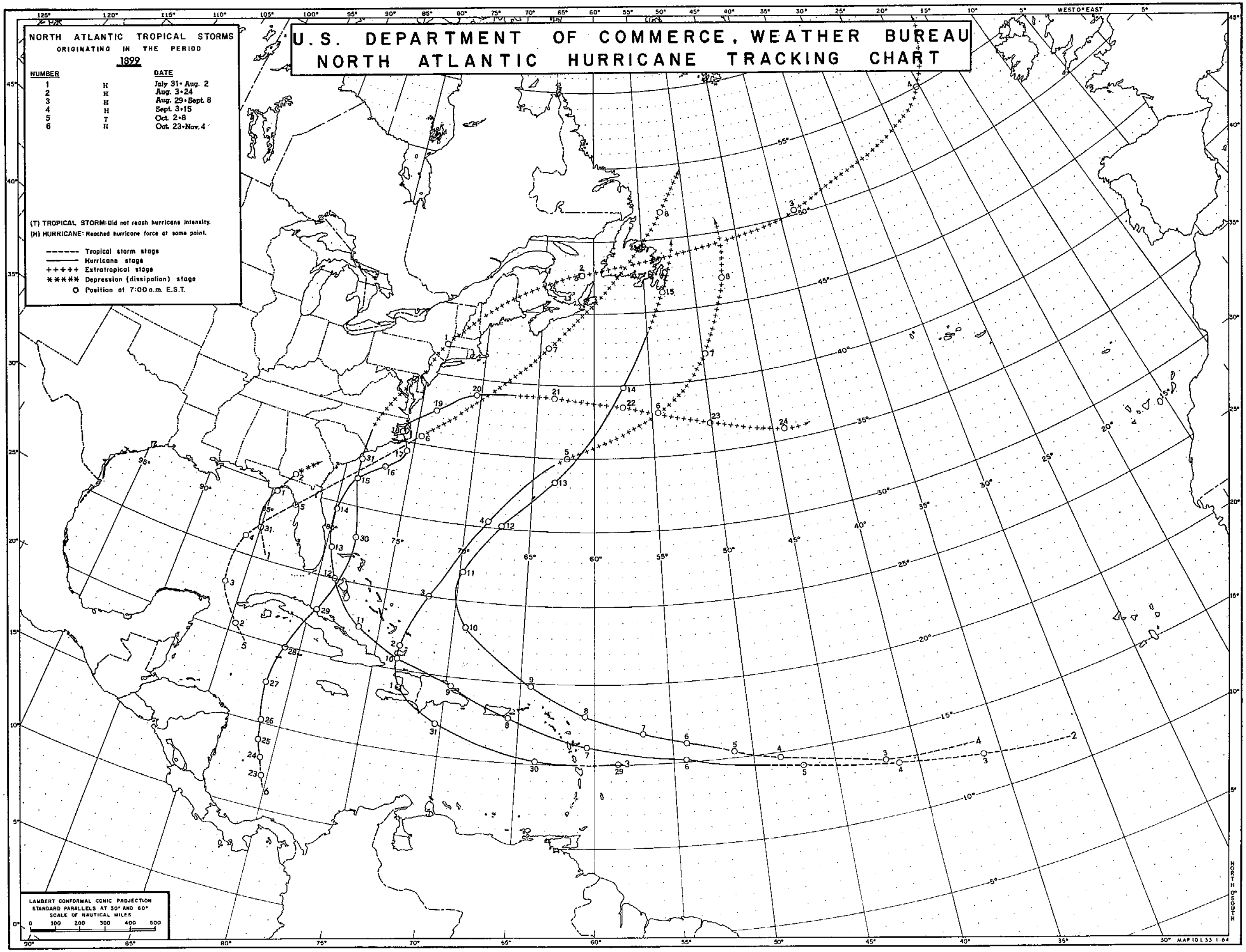
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1894
NUMBER DATE
1 T Aug. 5-8
2 H Aug. 30-Sept. 9
3 H Sept. 18-30
4 H Oct. 1-12
5 H Oct. 11-20
6 H Oct. 21-31
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1895
NUMBER
DATE
1 T Aug. 14-17
2 H Aug. 22-29
3 T Sept. 28 - Oct. 7
4 T Oct. 2-7
5 H Oct. 12-26
6 T Oct. 13-16
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

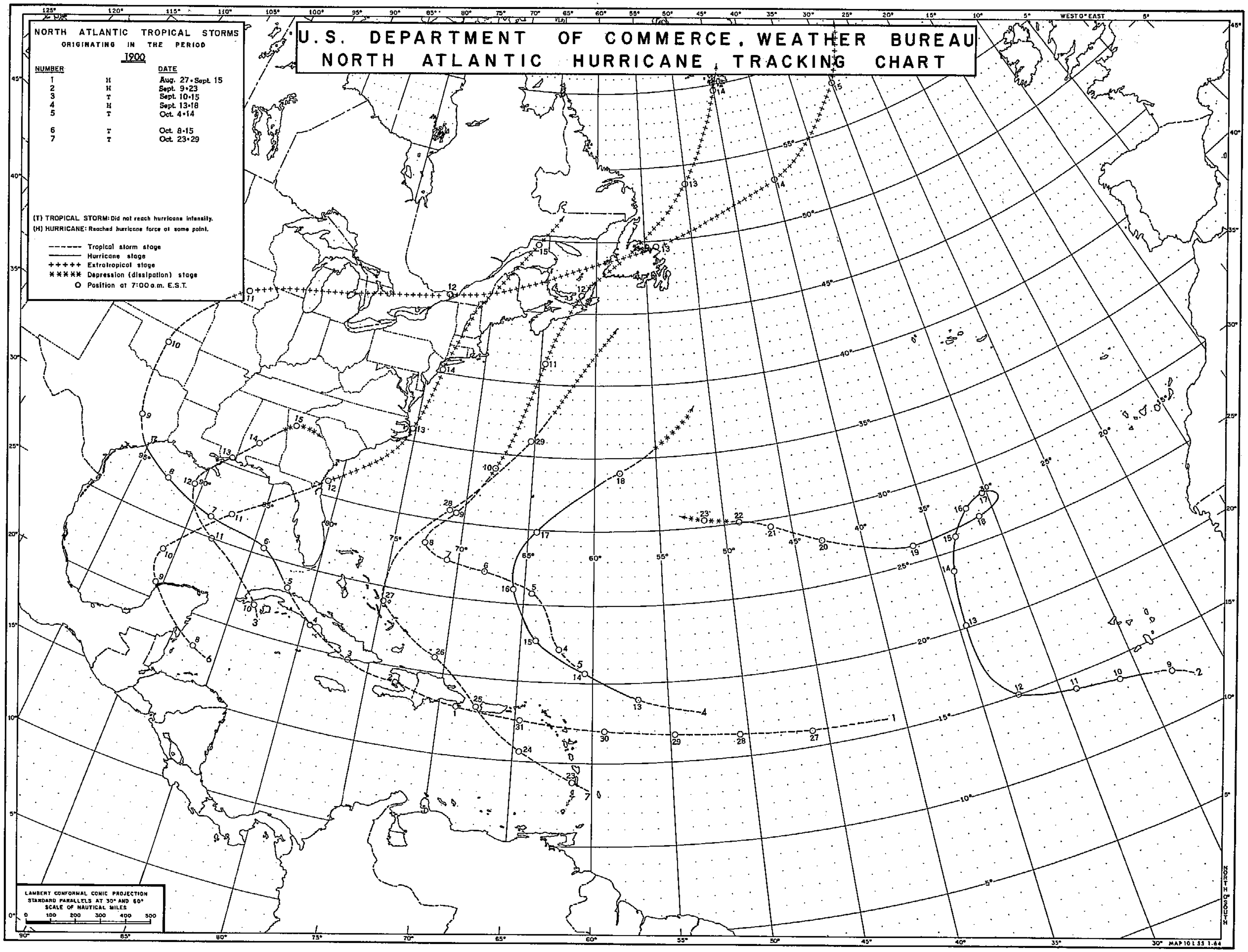

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1896
NUMBER
DATE
1 H July 4-12
2 H Aug. 30-Sept. 11
3 H Sept. 18-28
4 H Sept. 22-29
5 H Oct. 7-16
6 H Oct. 26-Nov. 9
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1897
NUMBER
DATE
1 H Aug. 31-Sept. 10
2 H Sept. 10-13
3 T Sept. 20-25
4 T Oct. 10-22
5 T Oct. 23-31
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

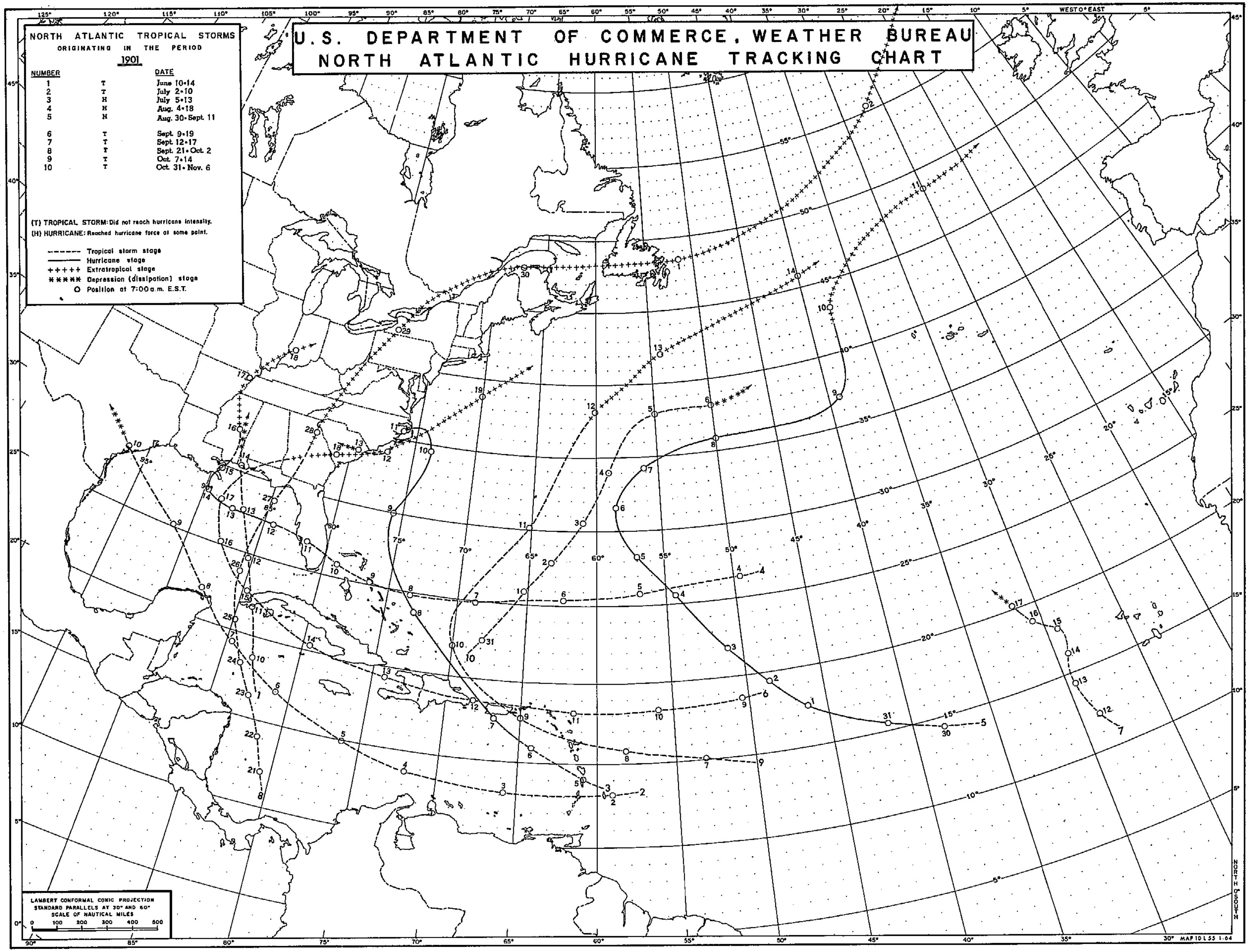

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1898
NUMBER DATE
1 H Aug. 2-3
2 H Aug. 30-Sept. 1
3 H Sept. 5-20
4 T Sept. 12-22
5 T Sept. 20-28
6 T Sept. 20-28
7 H Sept. 25-Oct. 6
8 T Oct. 2-14
9 T Oct. 27-Nov. 4
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm
Hurricane
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

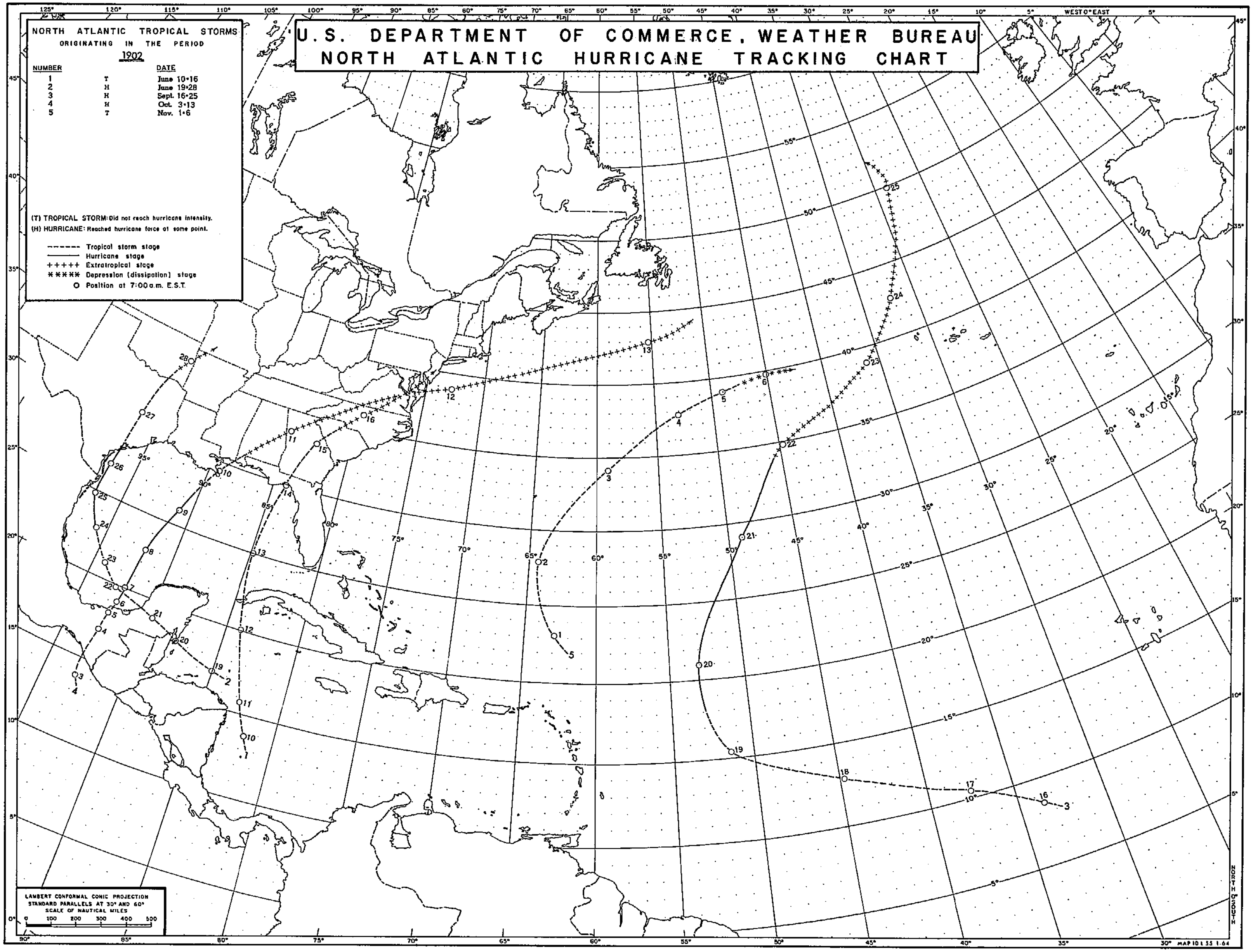


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1899
NUMBER
DATE
1 H July 31 - Aug. 2
2 H Aug. 3 - 24
3 H Aug. 29 - Sept. 8
4 H Sept. 3 - 15
5 T Oct. 2 - 8
6 H Oct. 23 - Nov. 4
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0 EAST
NORTH 0 SOUTH

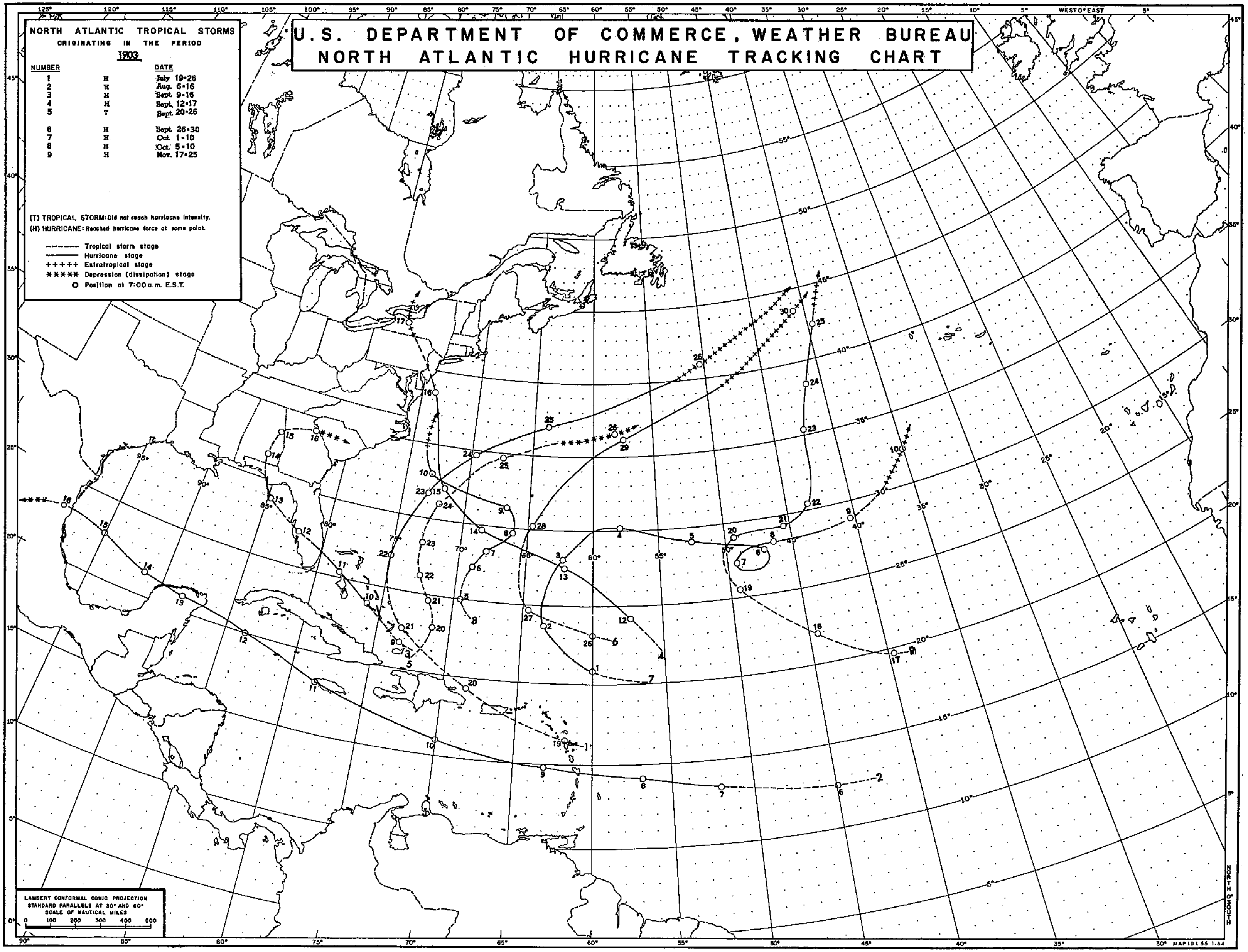


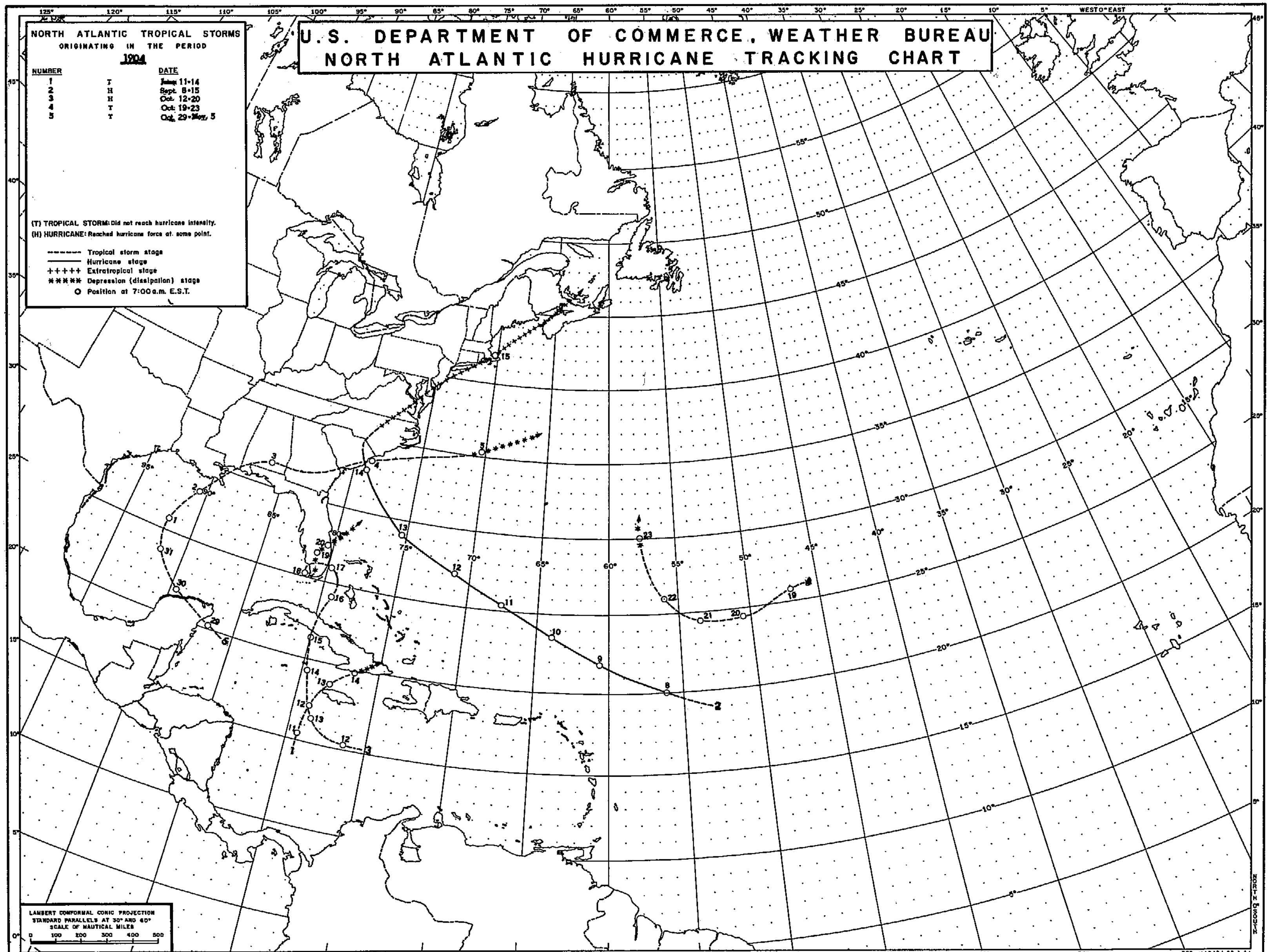
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1900
NUMBER DATE
1 H Aug. 27-Sept. 15
2 H Sept. 9-23
3 T Sept. 10-15
4 H Sept. 13-18
5 T Oct. 4-14
6 T Oct. 8-15
7 T Oct. 23-29
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

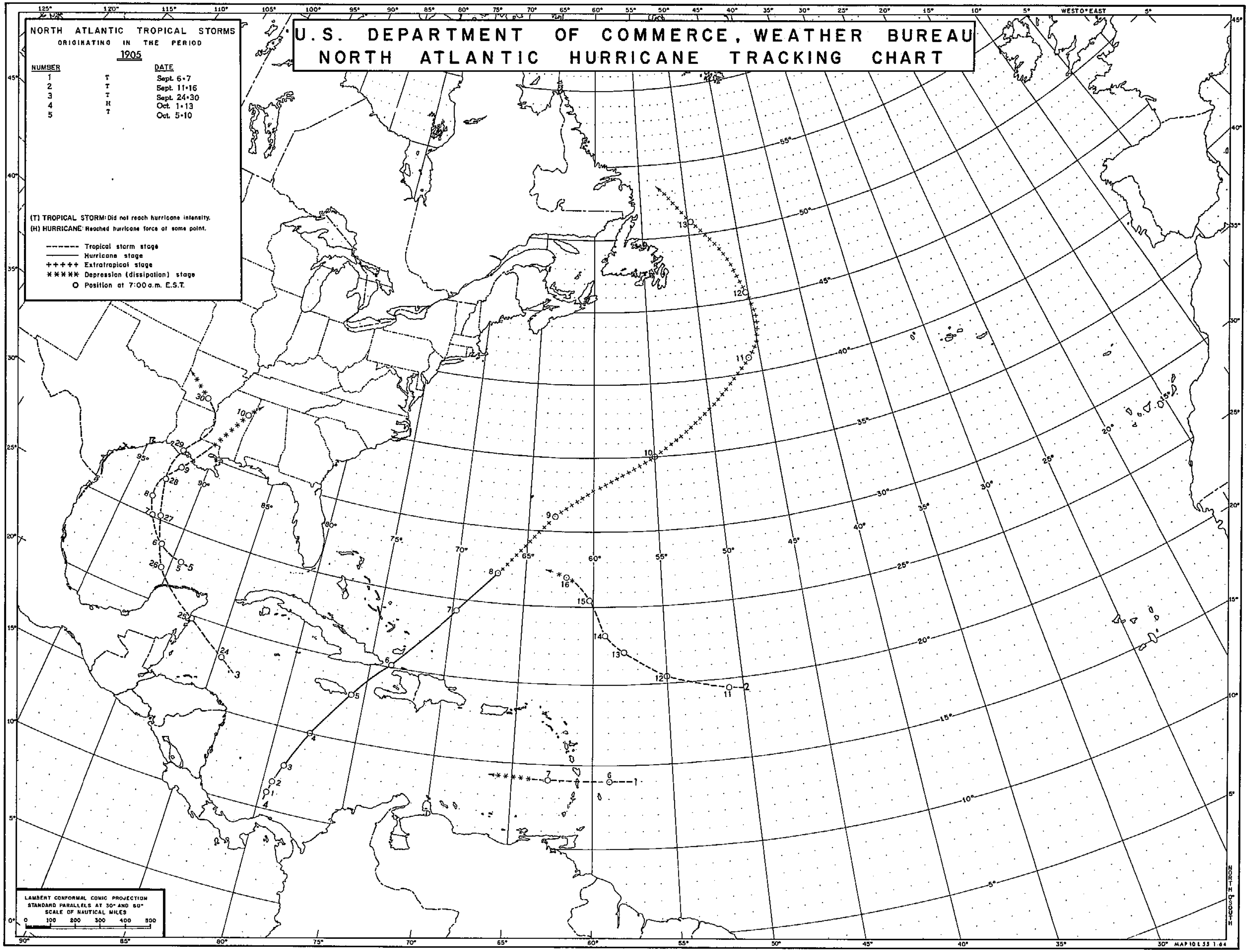

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1901
NUMBER DATE
1 T June 10-14
2 T July 2-10
3 H July 5-13
4 H Aug. 4-18
5 H Aug. 30-Sept. 11
6 T Sept. 9-19
7 T Sept. 12-17
8 T Sept. 21-Oct. 2
9 T Oct. 7-14
10 T Oct. 31-Nov. 6
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

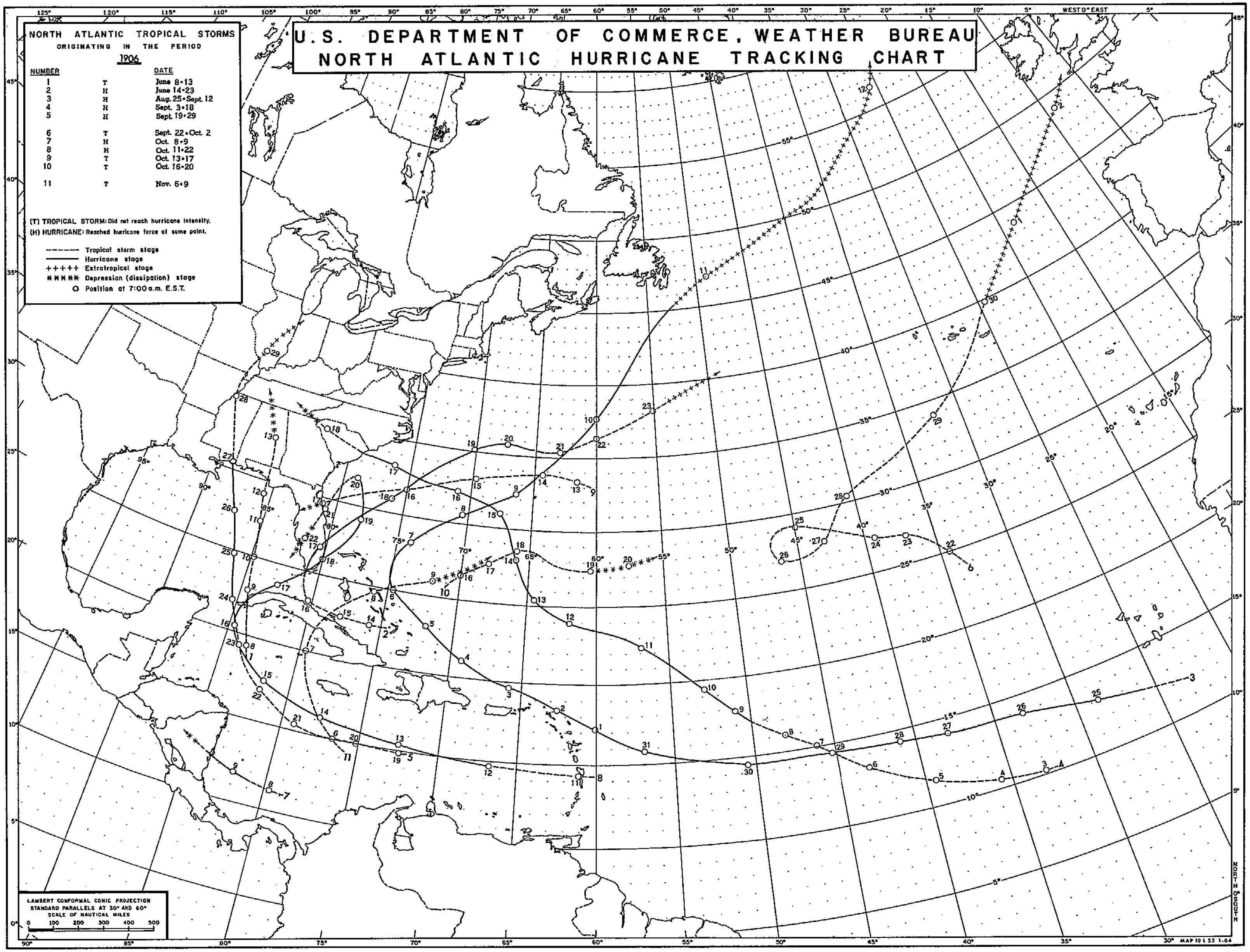


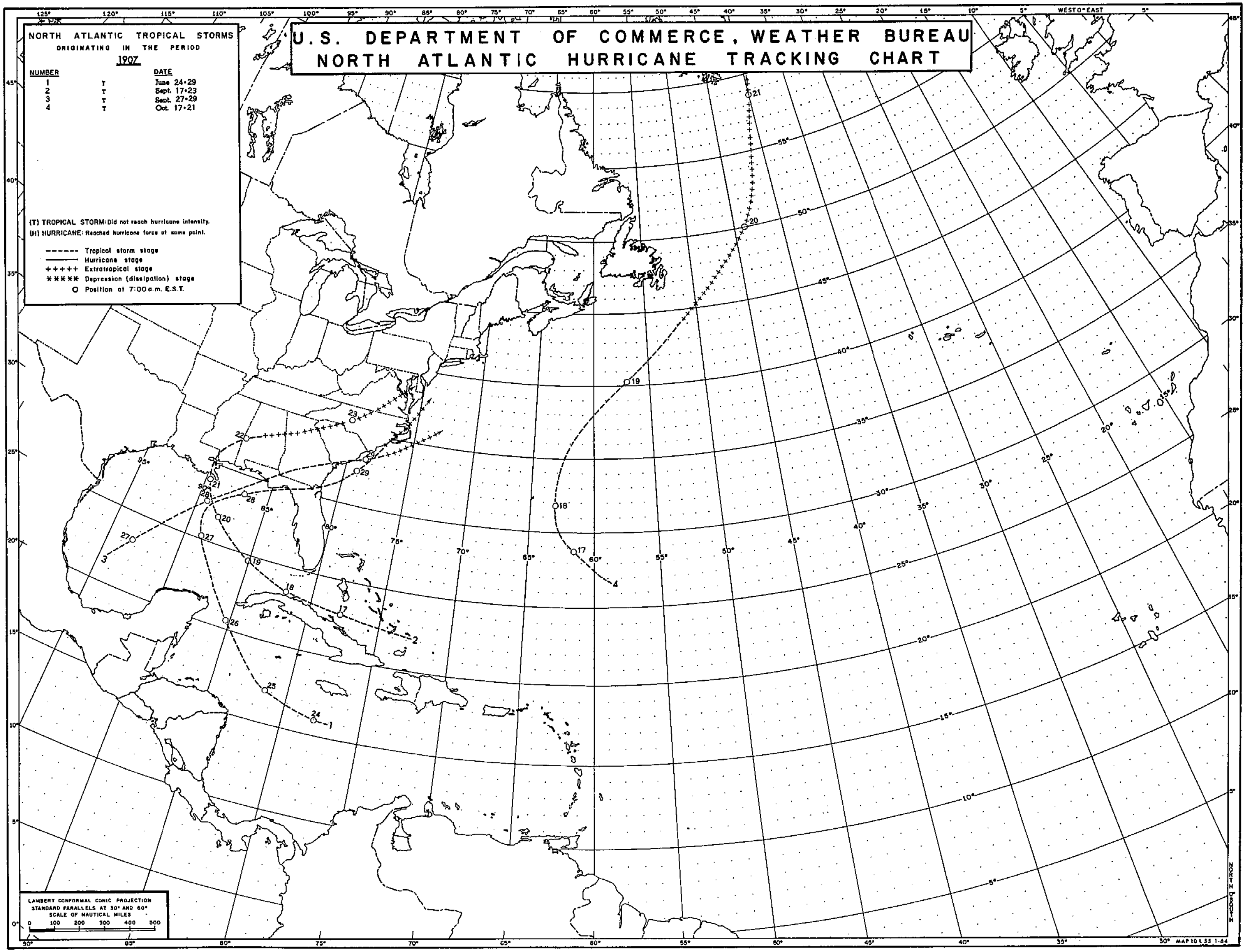
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1902
NUMBER DATE
1 T June 10-16
2 H June 19-28
3 H Sept. 16-25
4 H Oct. 3-13
5 T Nov. 1-6
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST O EAST
NORTH 0° SOUTH
MAP 10 L 35 1-64

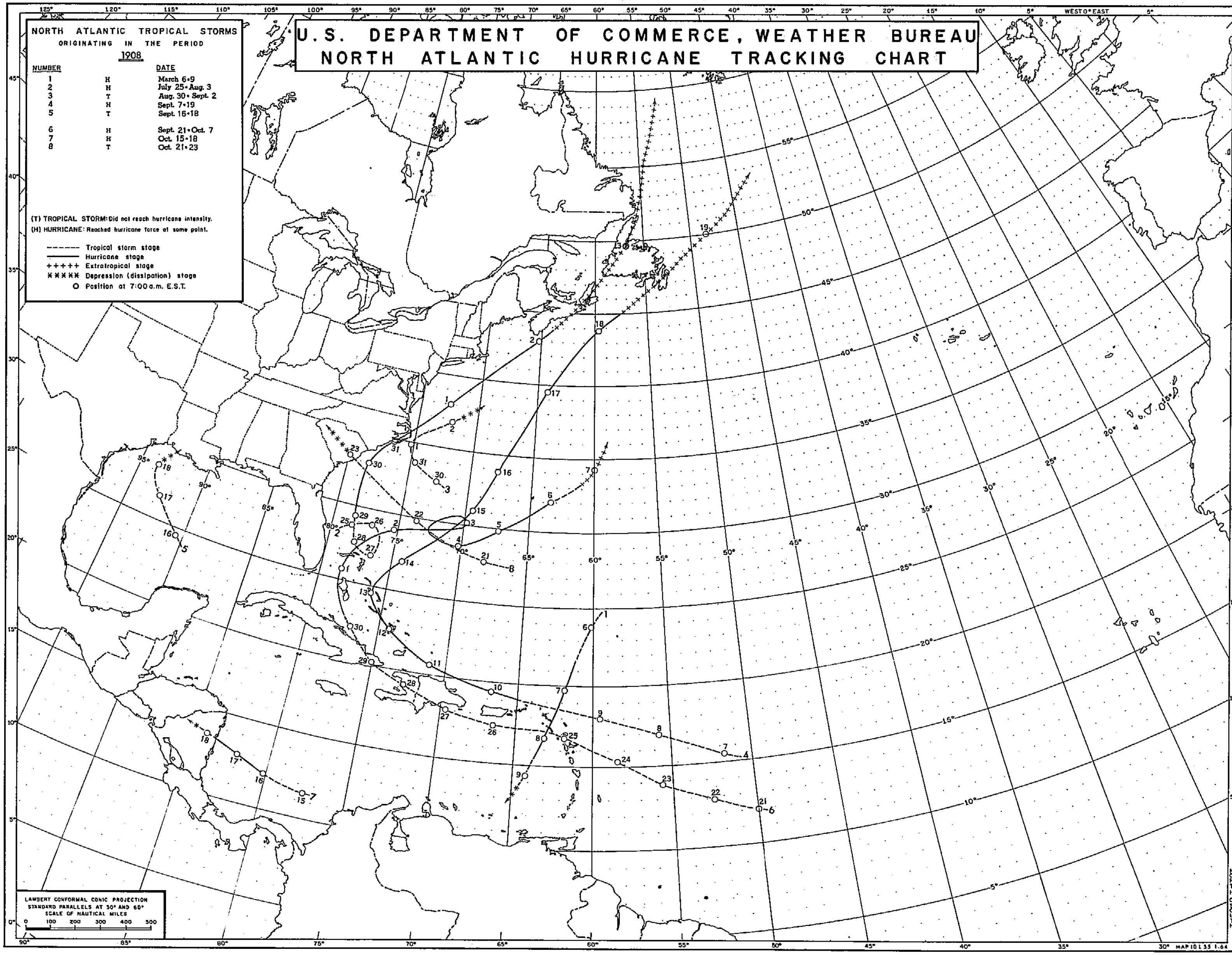

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1903
NUMBER
DATE
1 H July 19-26
2 H Aug. 6-16
3 H Sept. 9-16
4 H Sept. 12-17
5 T Sept. 20-26
6 H Sept. 26-30
7 H Oct. 1-10
8 H Oct. 5-10
9 H Nov. 17-25
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

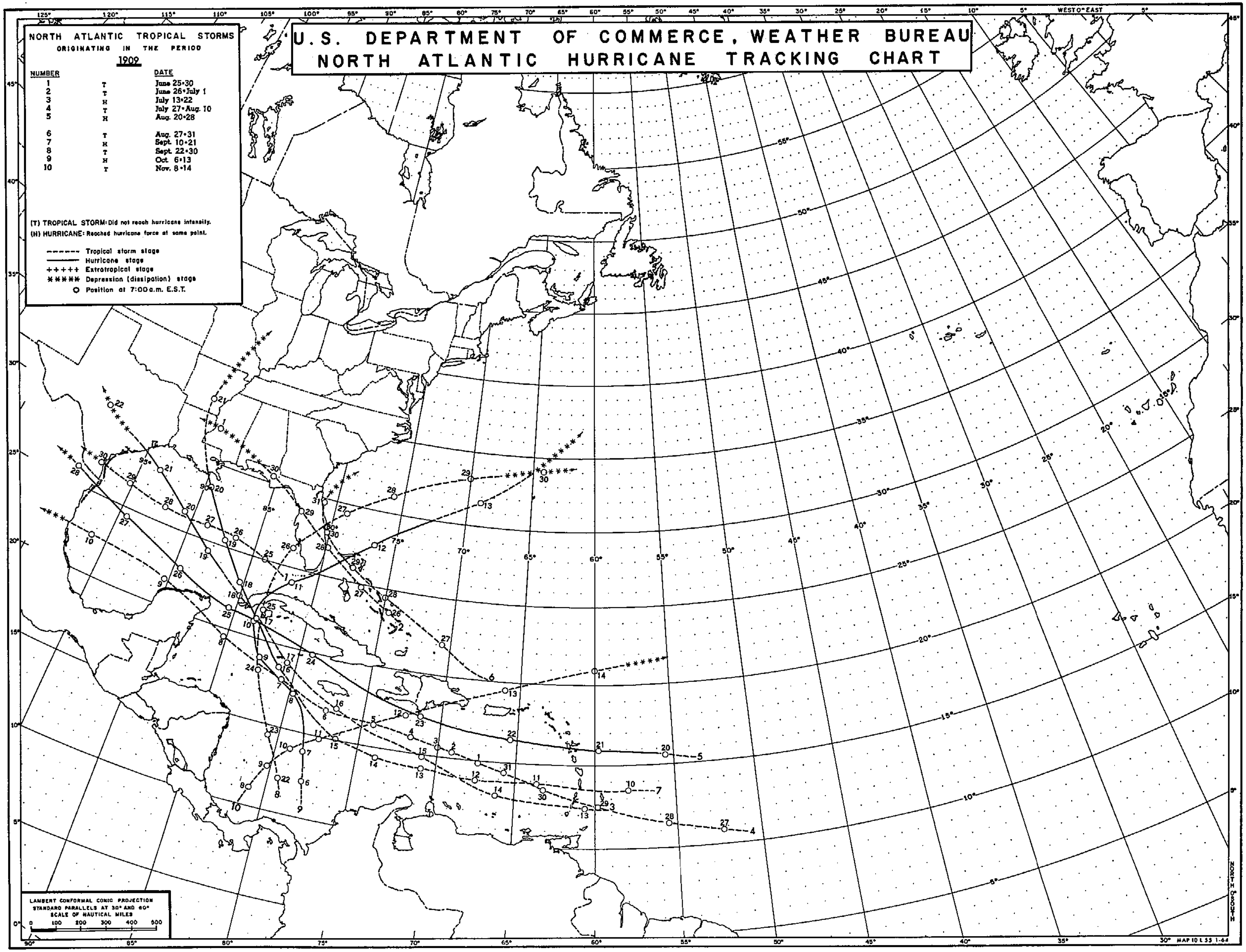

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1904
NUMBER
DATE
1 T June 11-14
2 H Sept. 8-15
3 H Oct. 12-20
4 T Oct. 19-23
5 T Oct. 29-Nov. 5
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1905
NUMBER
DATE
1 T Sept. 6-7
2 T Sept. 11-16
3 T Sept. 24-30
4 H Oct. 1-13
5 T Oct. 5-10
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

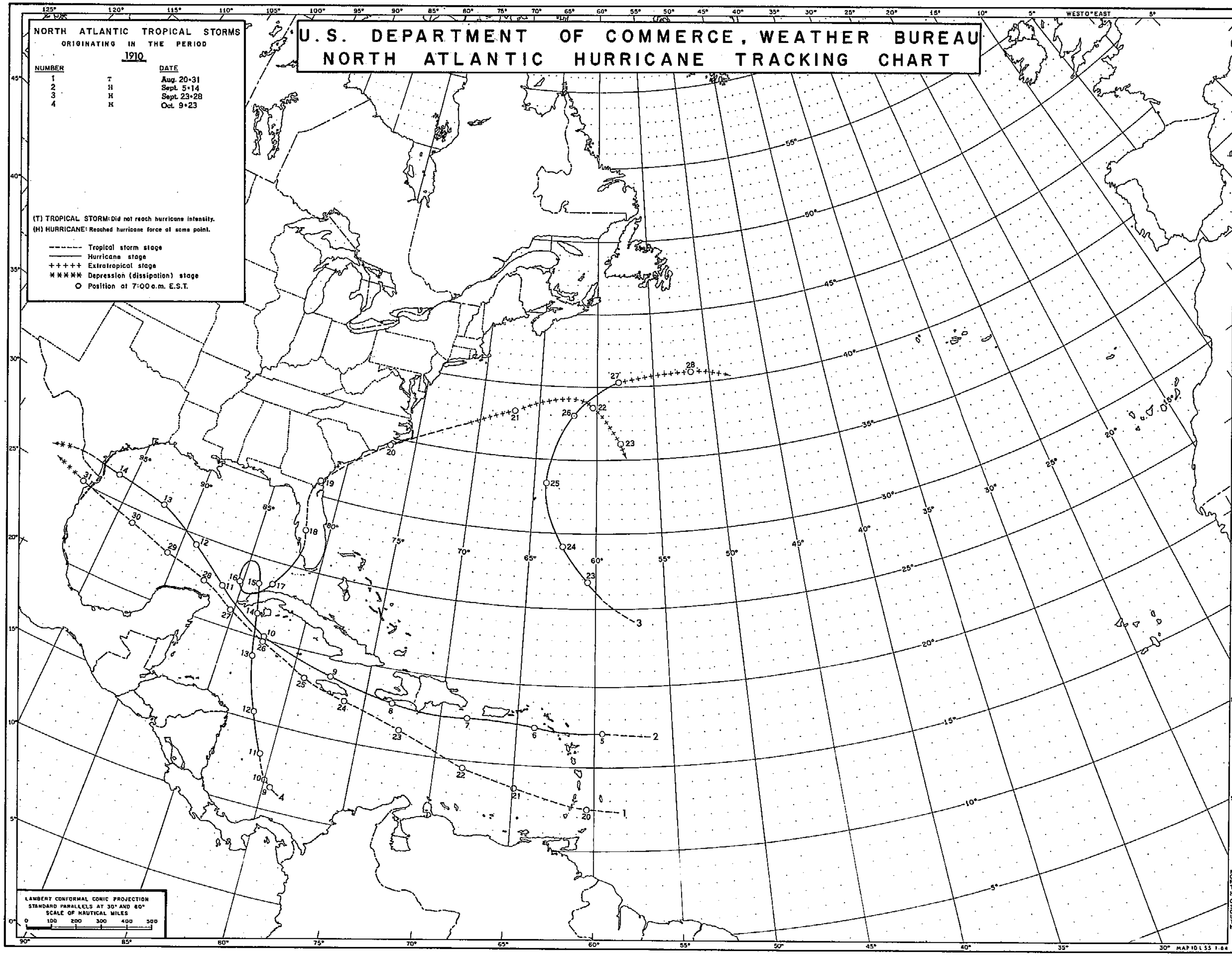

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1906
NUMBER DATE
1 T June 8-13
2 H June 14-23
3 H Aug. 25-Sept. 12
4 H Sept. 3-18
5 H Sept. 19-29
6 T Sept. 22-Oct. 2
7 H Oct. 8-9
8 H Oct. 11-22
9 T Oct. 13-17
10 T Oct. 16-20
11 T Nov. 6-9
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

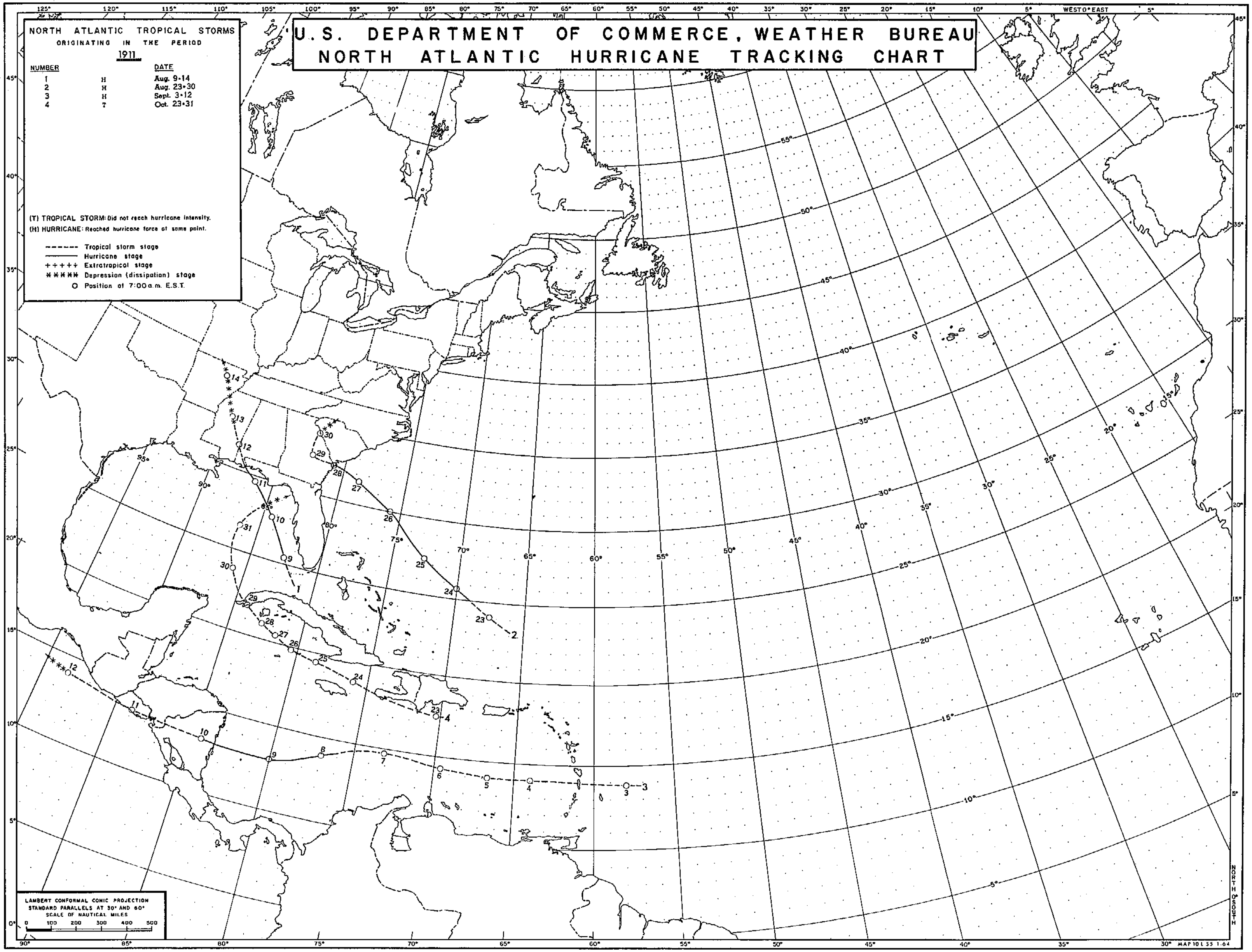

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1907
NUMBER
DATE
1 T June 24-29
2 T Sept. 17-23
3 T Sept. 27-29
4 T Oct. 17-21
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

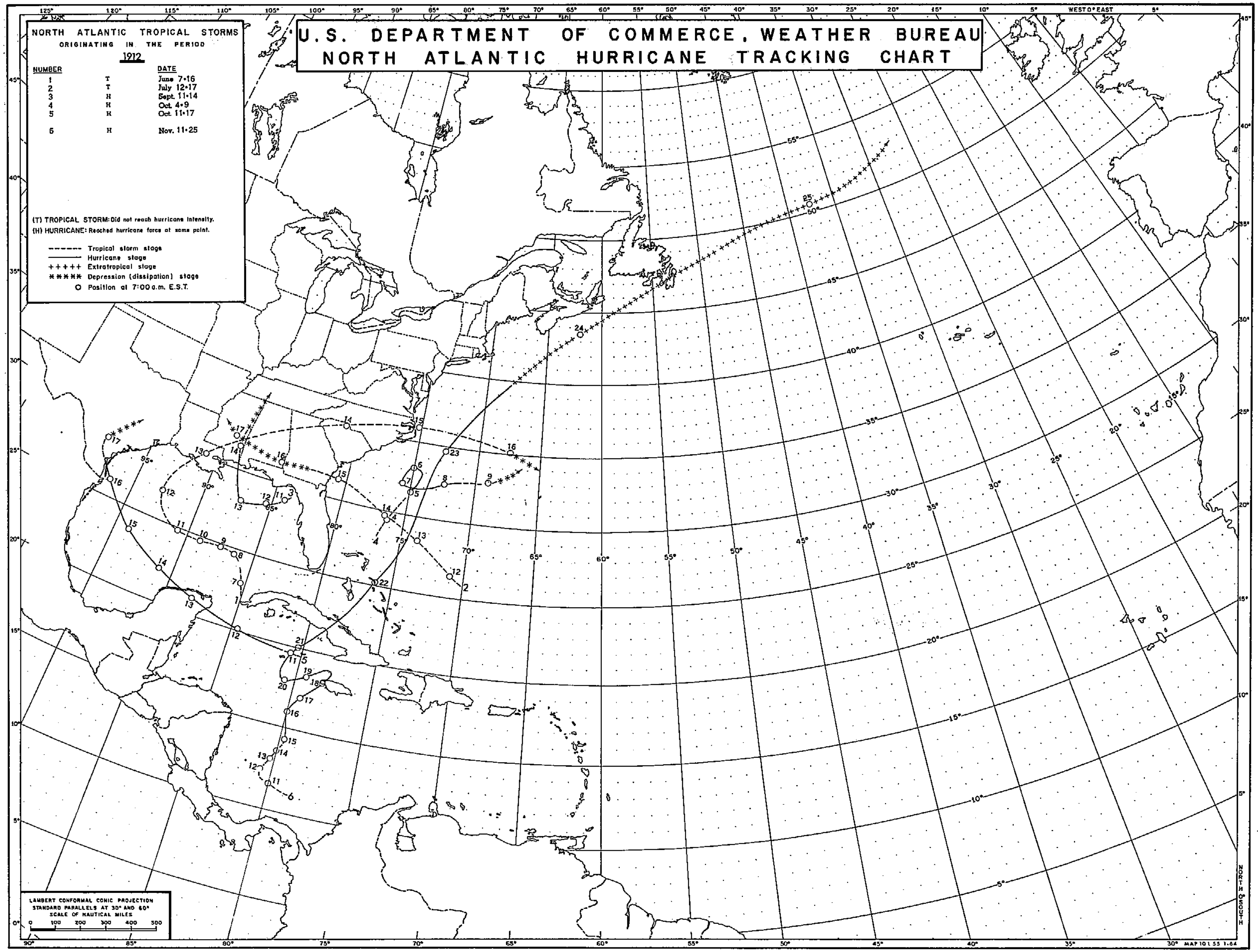

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1908
NUMBER
DATE
1 H March 6-9
2 H July 25-Aug. 3
3 T Aug. 30-Sept. 2
4 H Sept. 7-19
5 T Sept. 16-18
6 H Sept. 21-Oct. 7
7 H Oct. 15-18
8 T Oct. 21-23
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES



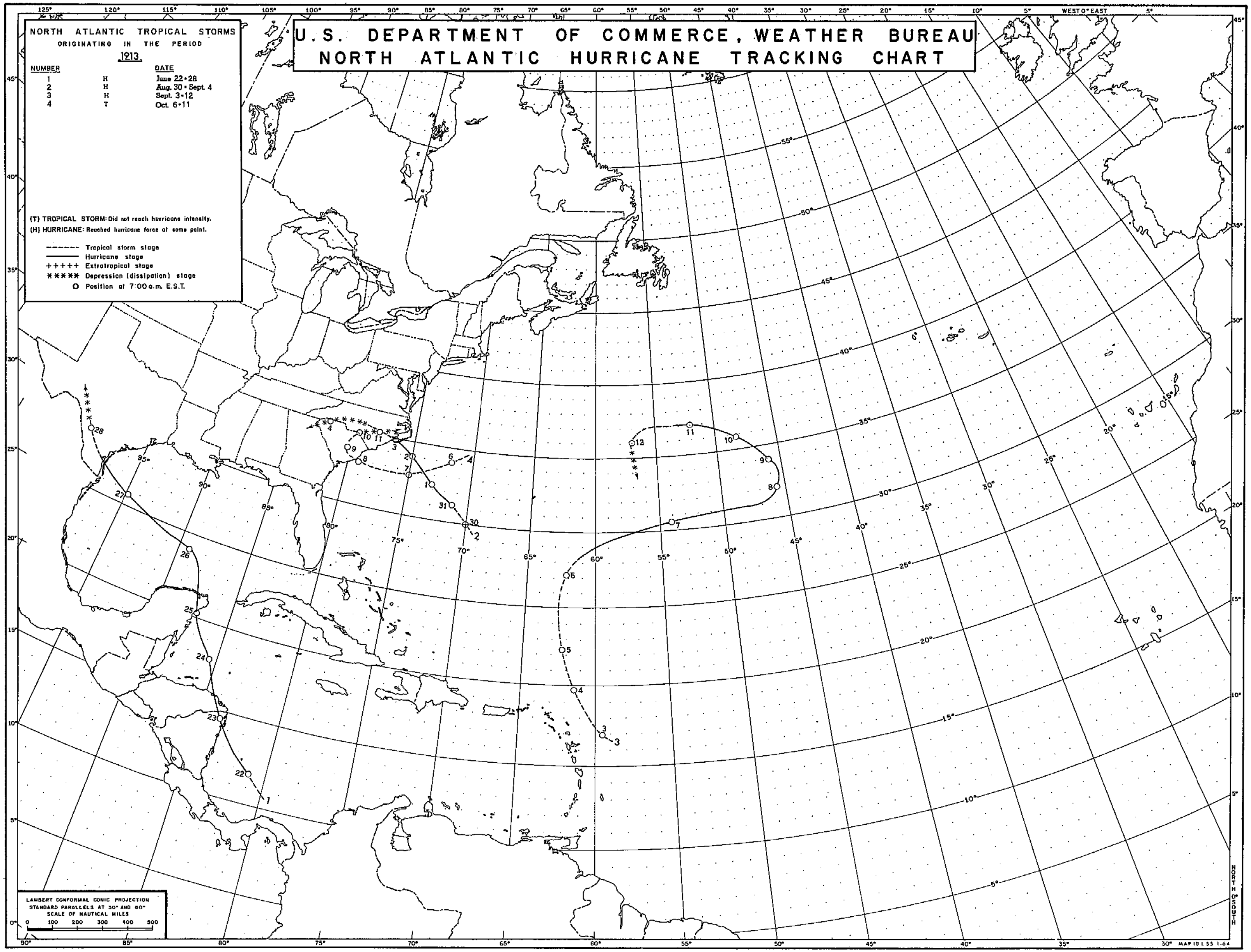
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1909
NUMBER DATE
1 T June 25-30
2 T June 26-July 1
3 H July 13-22
4 T July 27-Aug. 10
5 H Aug. 20-28
6 T Aug. 27-31
7 H Sept. 10-21
8 T Sept. 22-30
9 H Oct. 6-13
10 T Nov. 8-14
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
—— Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

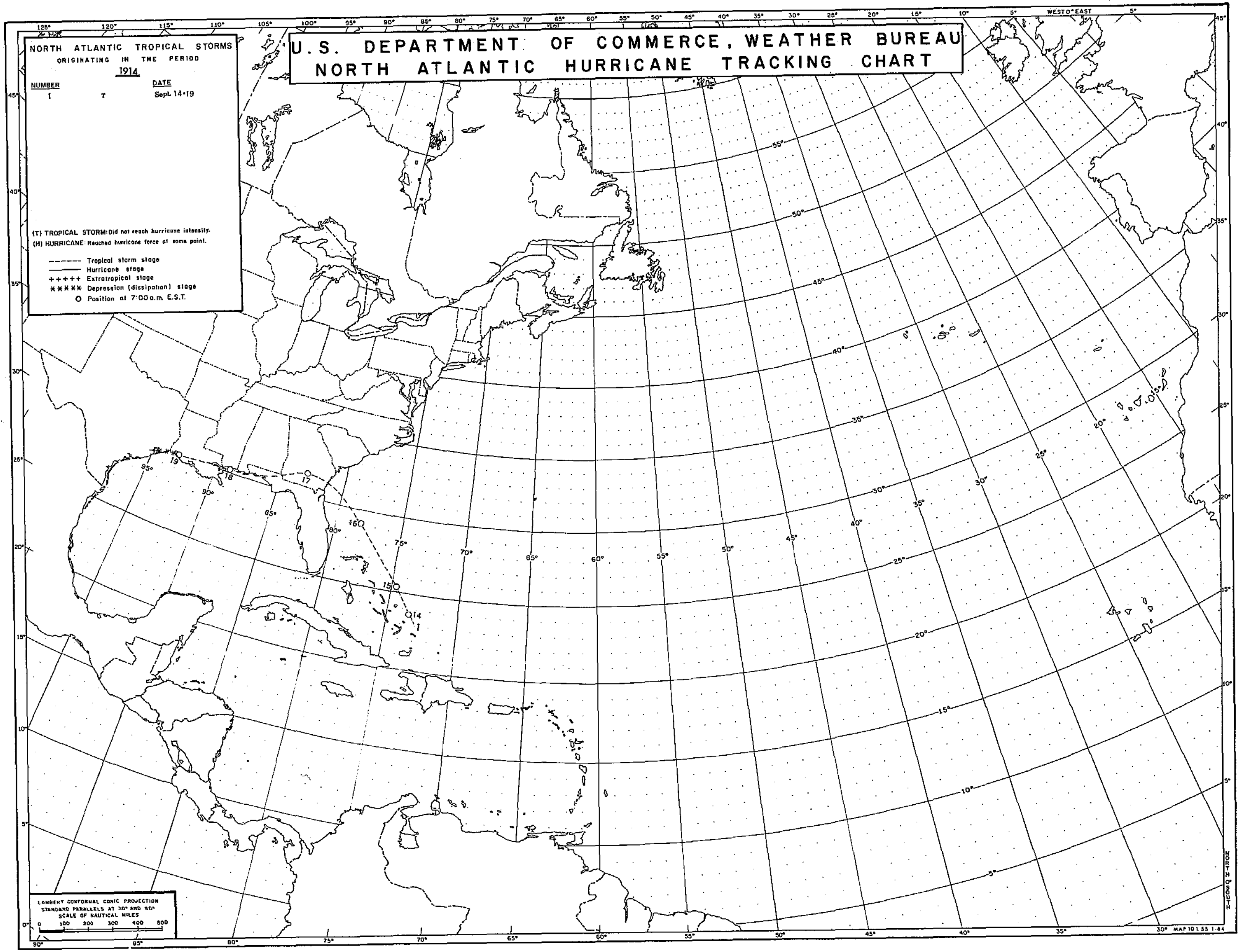

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1910
NUMBER DATE
1 T Aug. 20-31
2 H Sept. 5-14
3 H Sept. 23-28
4 H Oct. 9-23
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1911
NUMBER DATE
1 H Aug. 9-14
2 H Aug. 23-30
3 H Sept. 3-12
4 T Oct. 23-31
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L SS 1-64

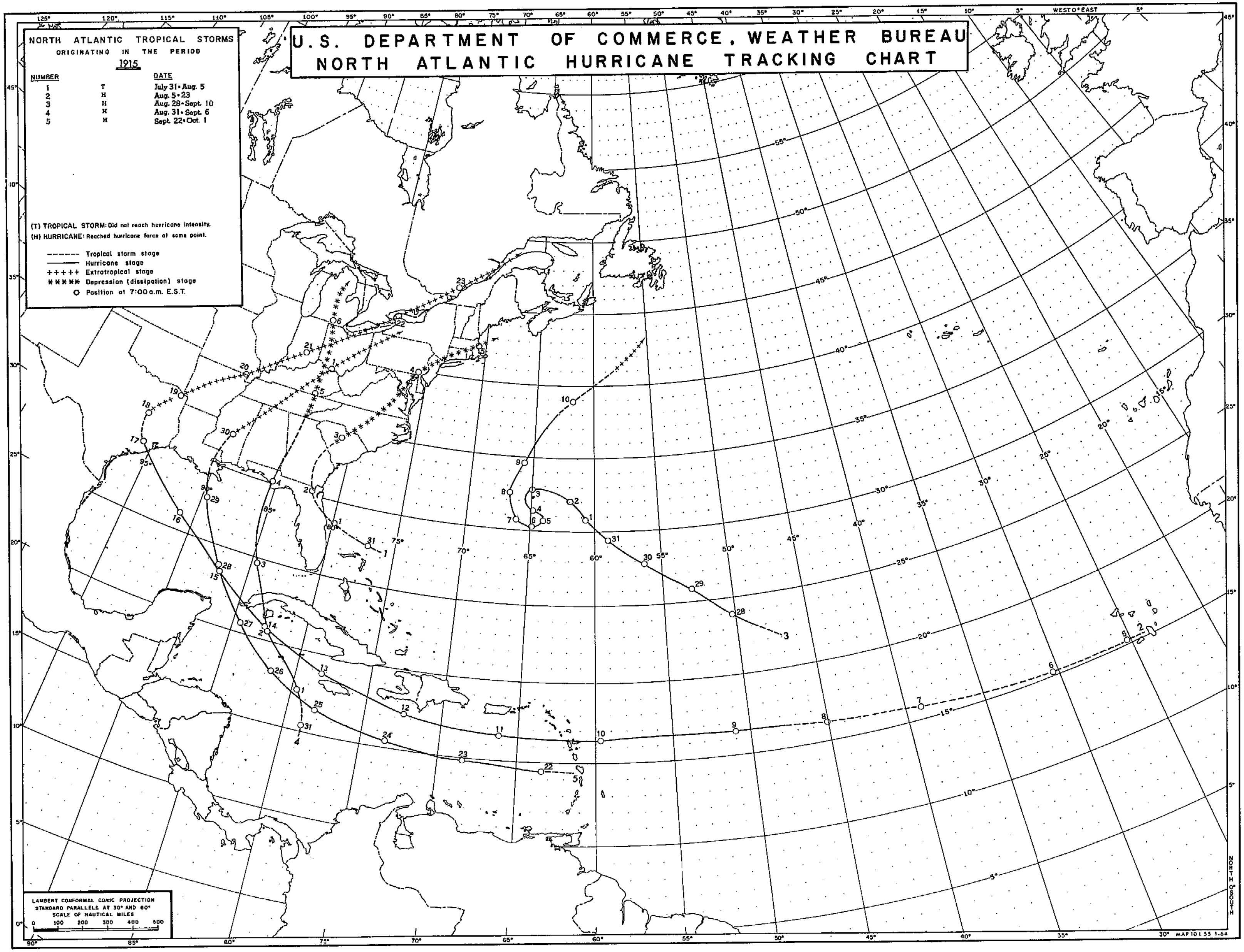


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1912
NUMBER
DATE
1 T June 7-16
2 T July 12-17
3 H Sept. 11-14
4 H Oct. 4-9
5 H Oct. 11-17
6 H Nov. 11-25
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

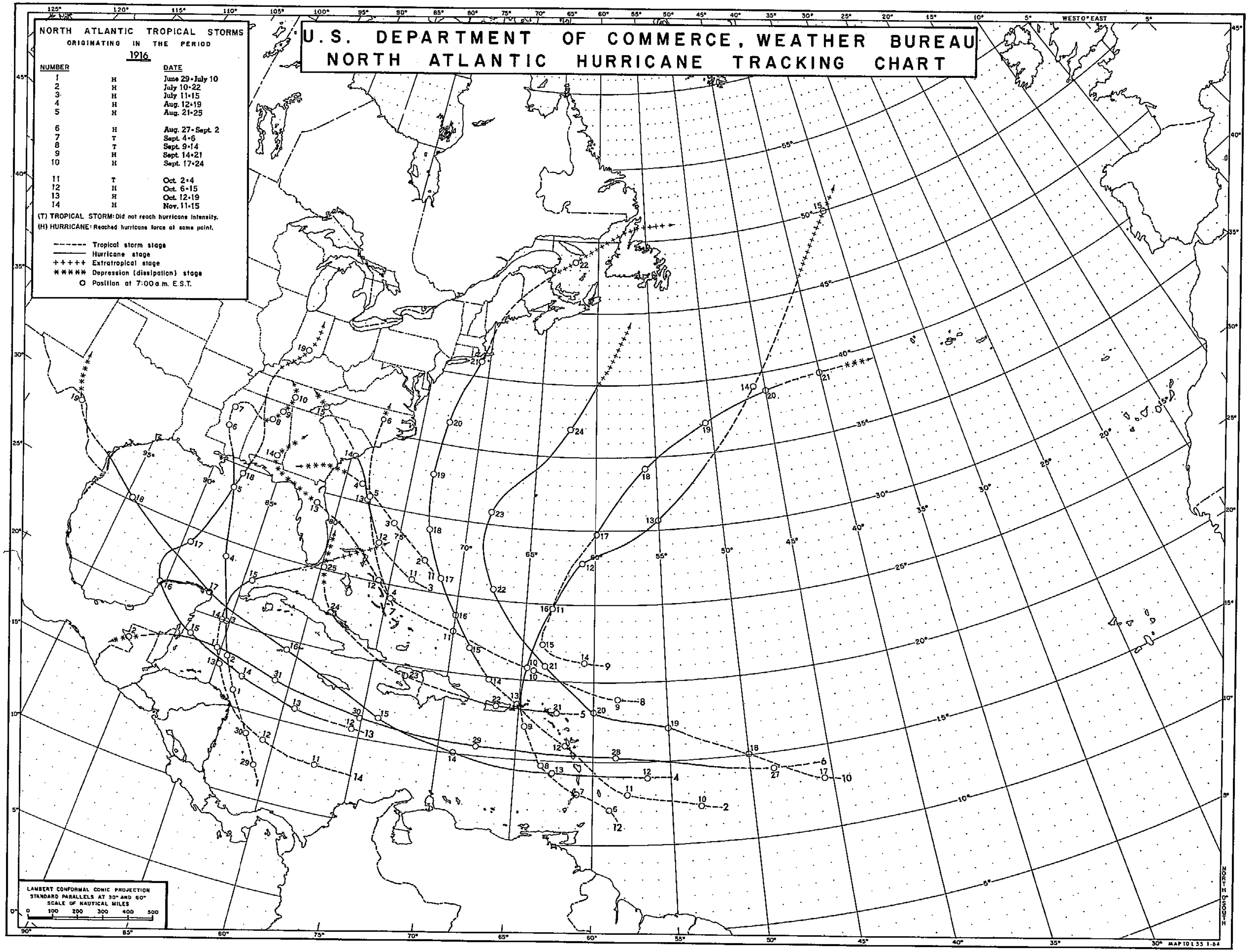

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1913
NUMBER DATE
1 H June 22-28
2 H Aug. 30 - Sept. 4
3 H Sept. 3-12
4 T Oct. 6-11
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH 0° SOUTH



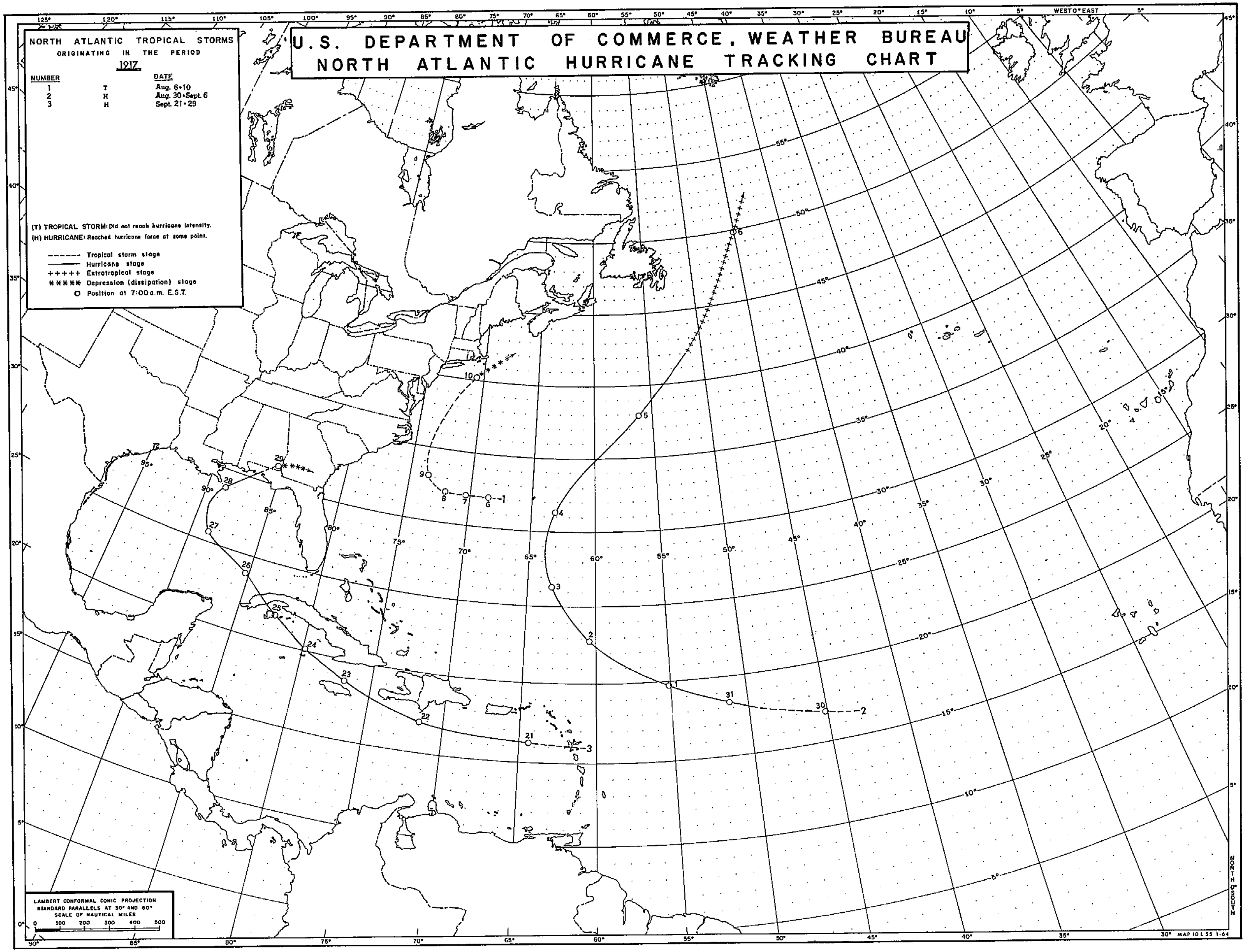
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1914
NUMBER
DATE
1
T
Sept. 14-19
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
—— Hurricane stage
+++++ Extratropical stage
✱✱✱✱✱ Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
14
15
16
17
18
19
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH 0° SOUTH
WEST 0° EAST

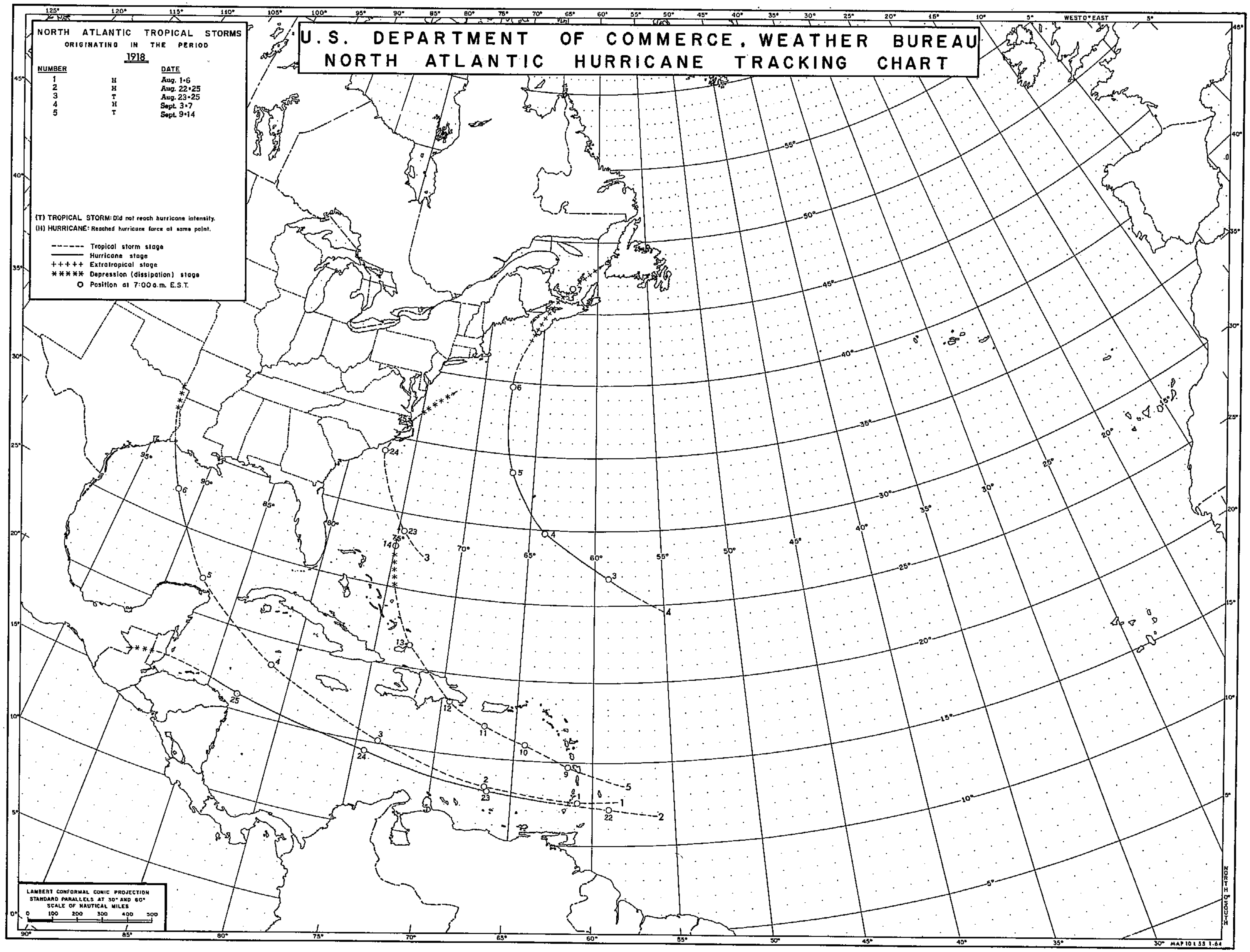


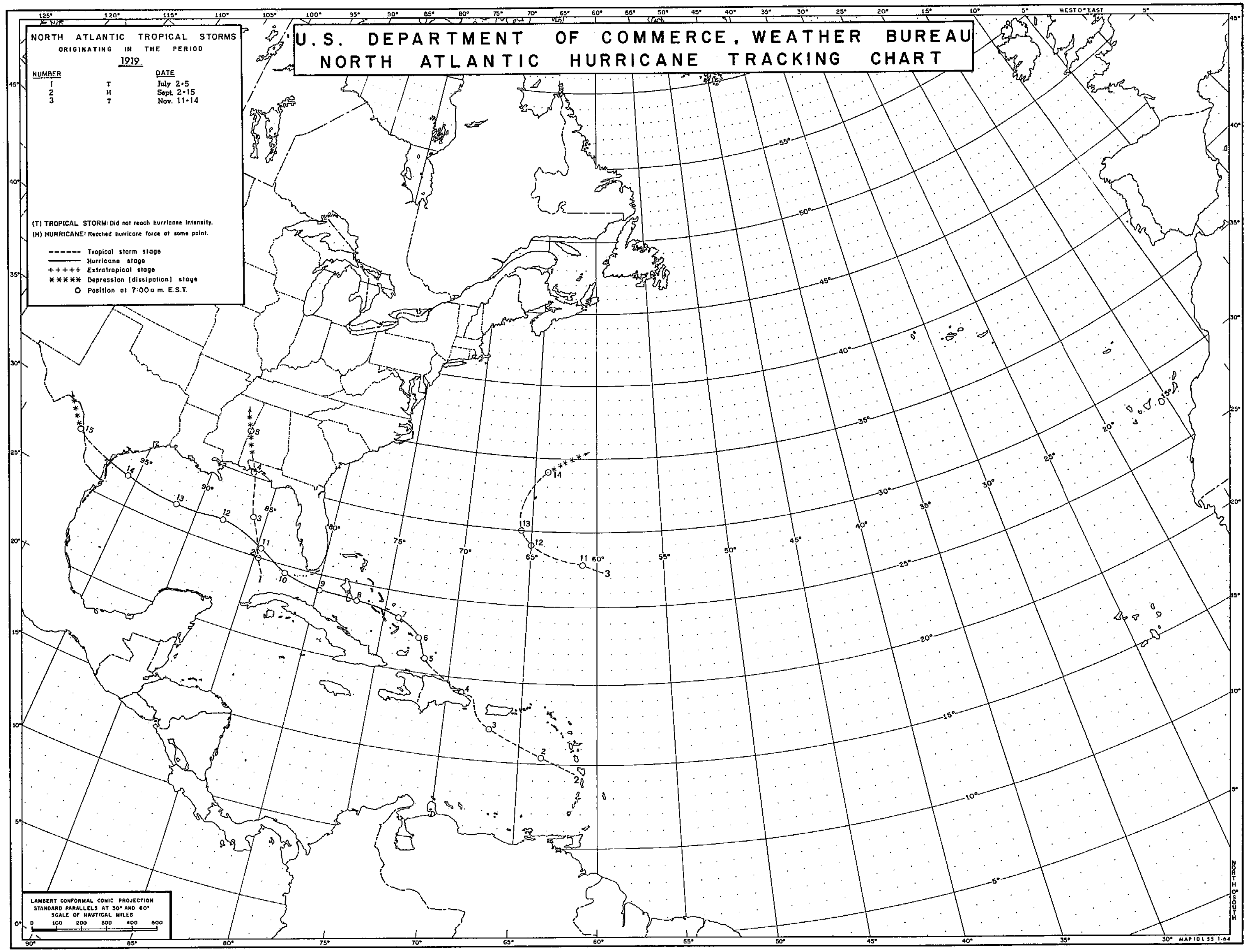
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1915
NUMBER
DATE
1 T July 31-Aug. 5
2 H Aug. 5-23
3 H Aug. 28-Sept. 10
4 H Aug. 31-Sept. 6
5 H Sept. 22-Oct. 1
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 101 55 1-64



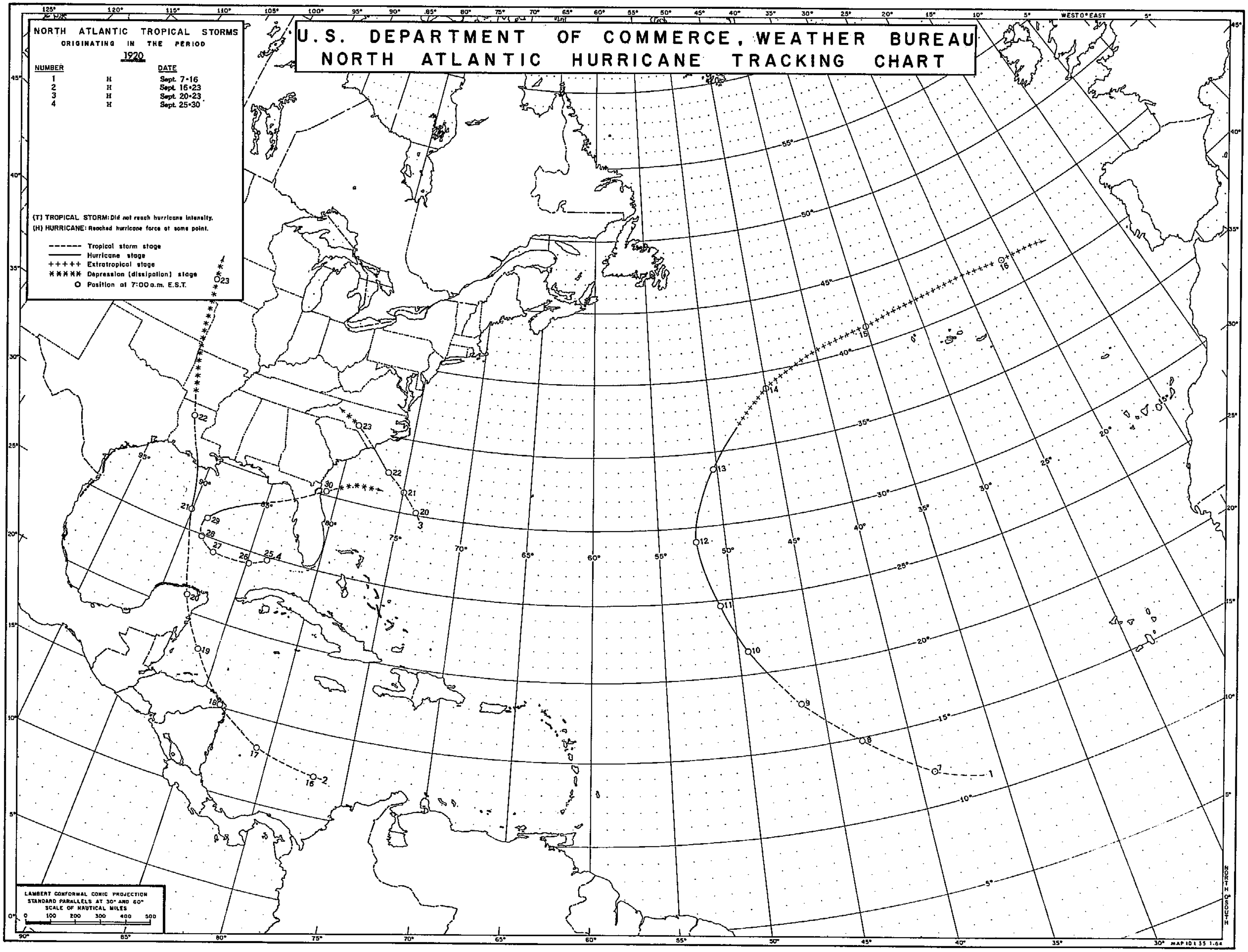
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1916
NUMBER DATE
1 H June 29-July 10
2 H July 10-22
3 H July 11-15
4 H Aug. 12-19
5 H Aug. 21-25
6 H Aug. 27-Sept. 2
7 T Sept. 4-6
8 T Sept. 9-14
9 H Sept. 14-21
10 H Sept. 17-24
11 T Oct. 2-4
12 H Oct. 6-15
13 H Oct. 12-19
14 H Nov. 11-15
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
——— Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

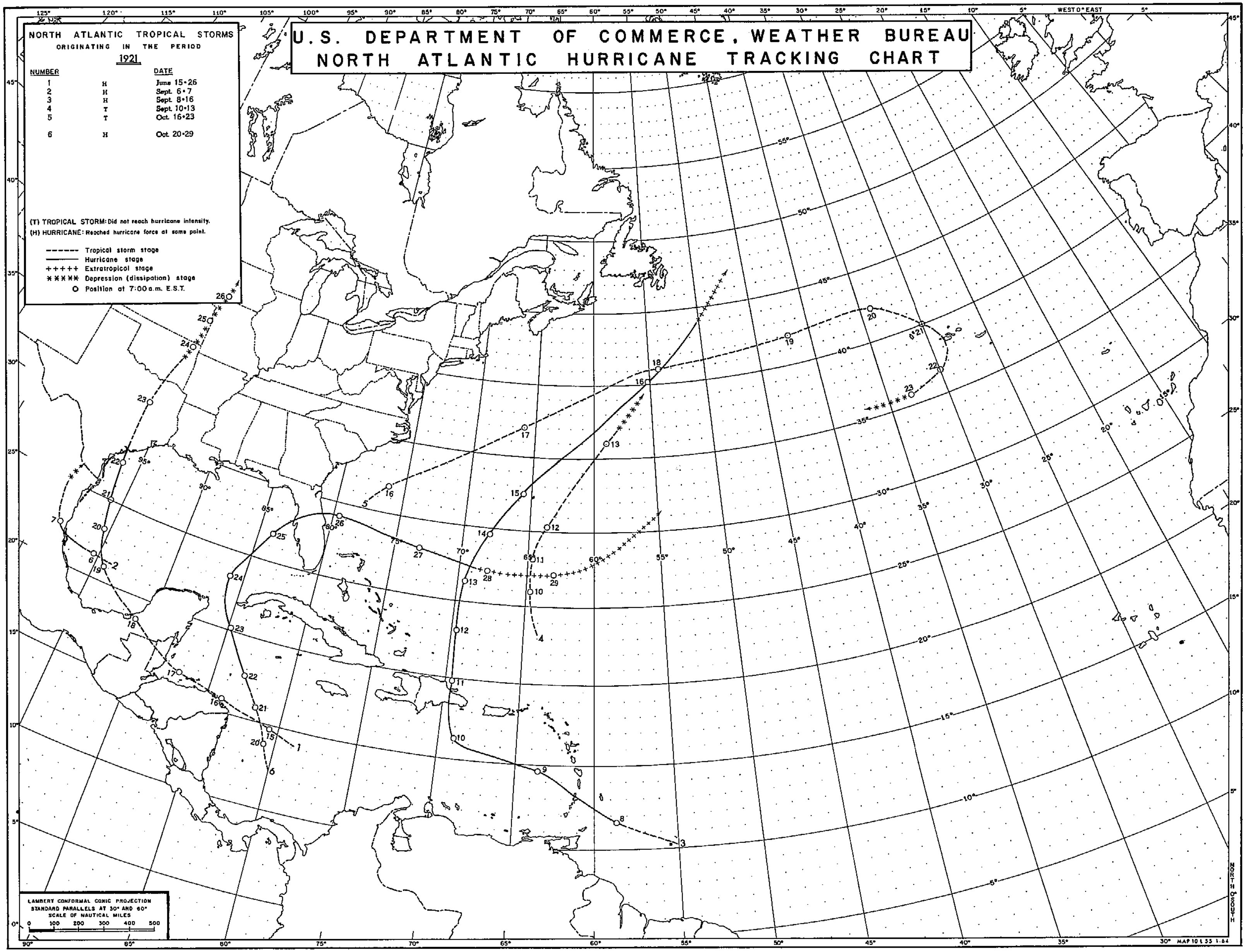

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1917
NUMBER
DATE
1 T Aug. 6-10
2 H Aug. 30-Sept. 6
3 H Sept. 21-29
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH
SOUTH
MAP 10 L 55 1-64

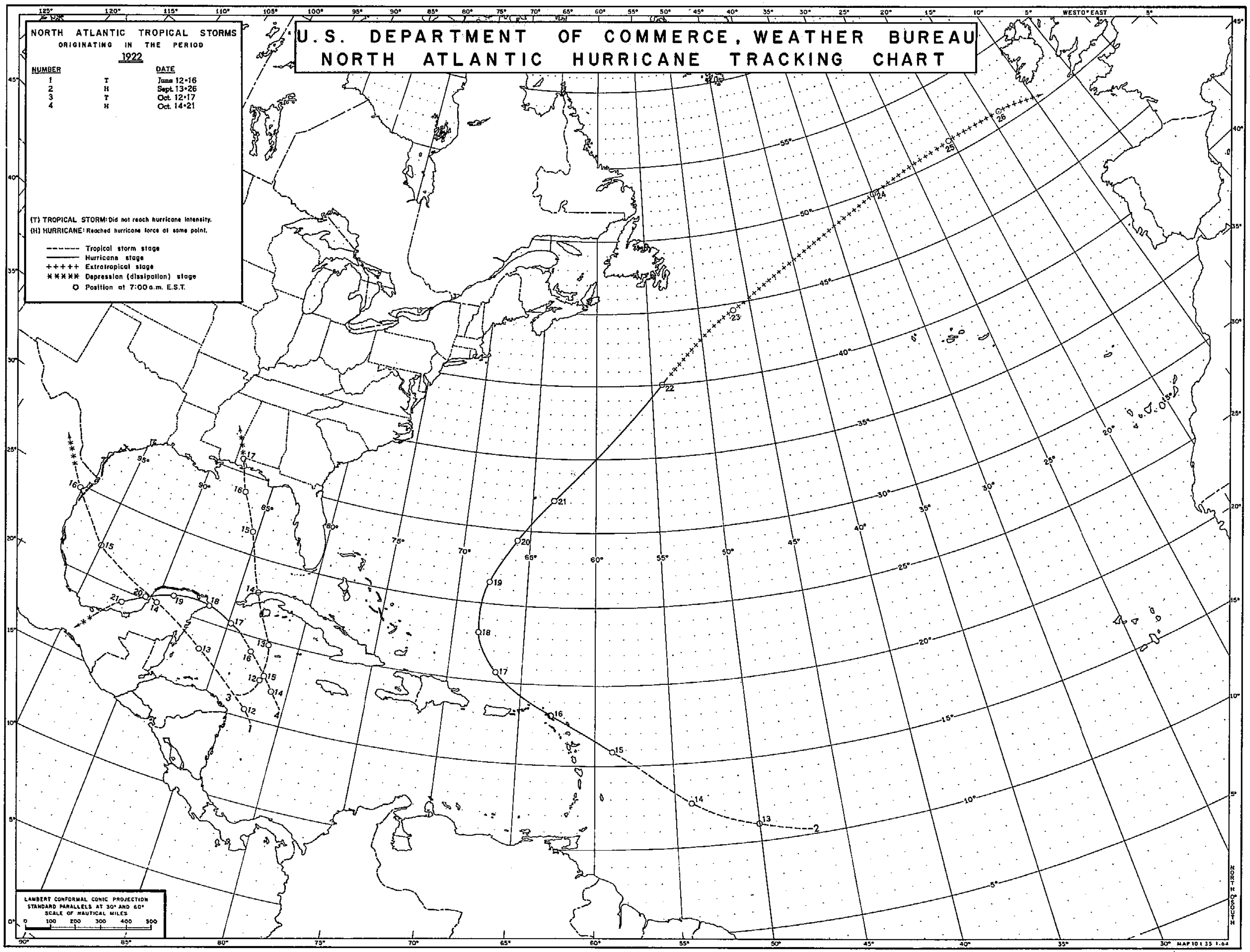

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1918
NUMBER
DATE
1 H Aug. 1-6
2 H Aug. 22-25
3 T Aug. 23-25
4 H Sept. 3-7
5 T Sept. 9-14
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST OF EAST
NORTH OF SOUTH

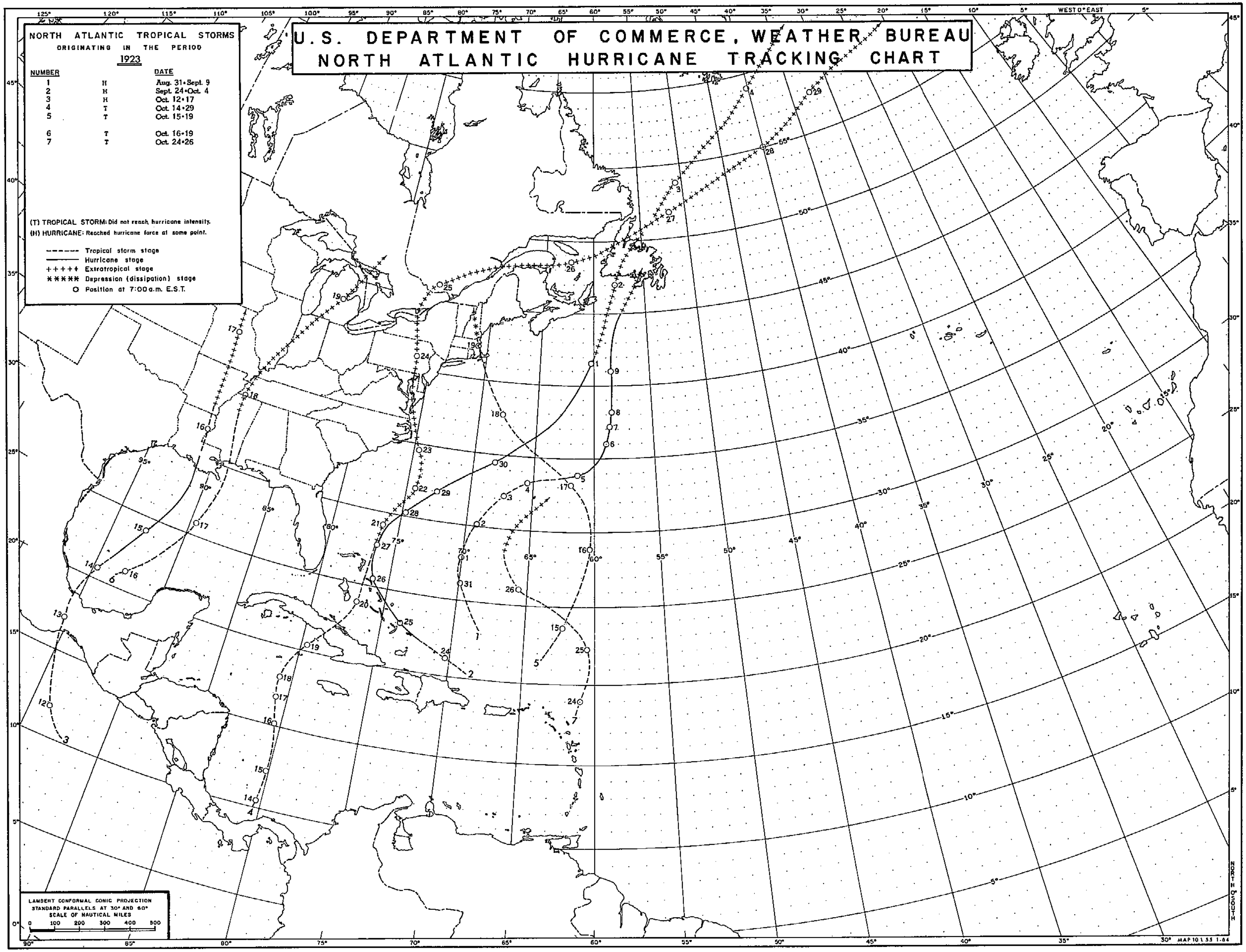


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1919
NUMBER DATE
1 T July 2-5
2 H Sept. 2-15
3 T Nov. 11-14
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
✱✱✱✱✱ Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

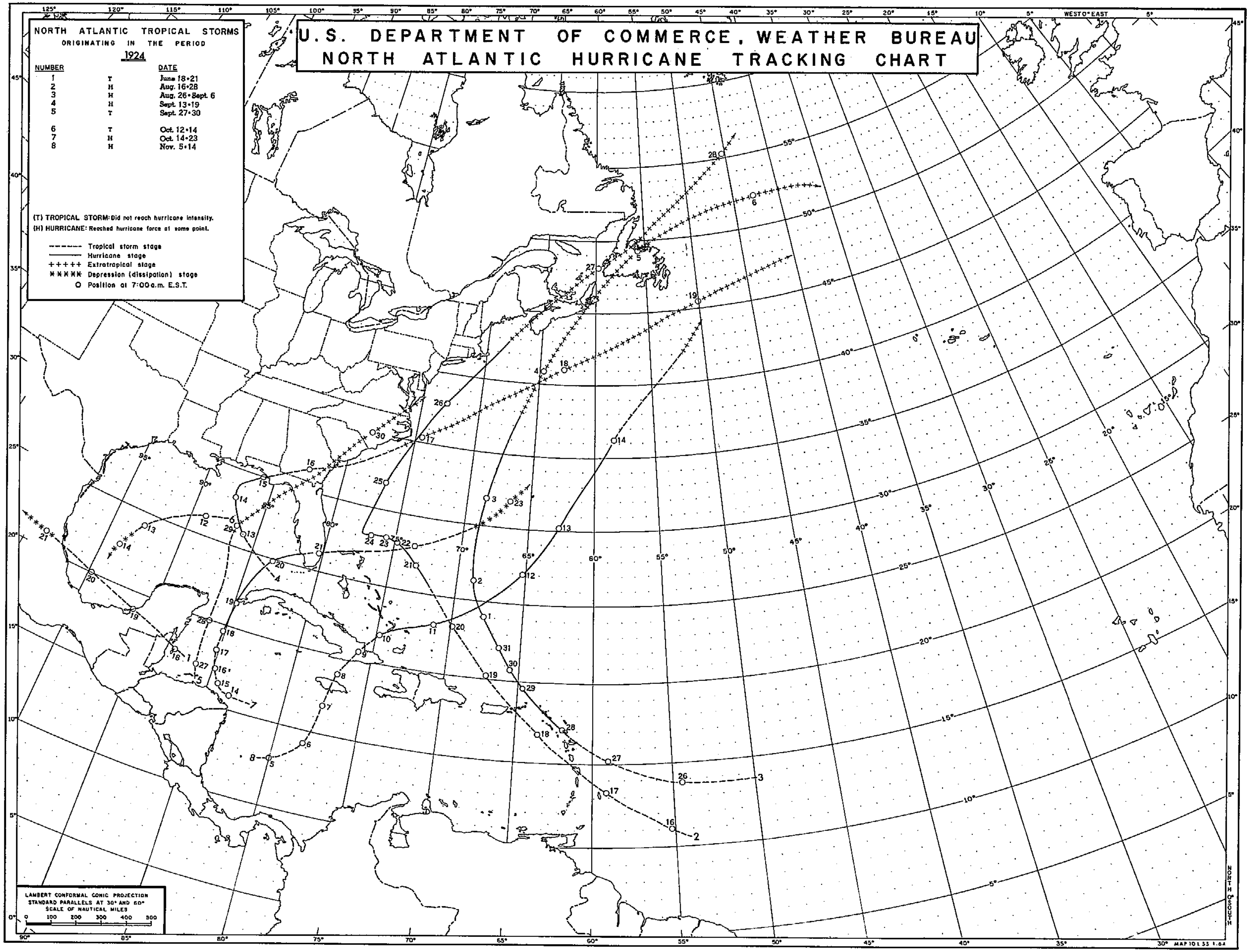

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1920
NUMBER
DATE
1 H Sept. 7-16
2 H Sept. 16-23
3 H Sept. 20-23
4 H Sept. 25-30
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

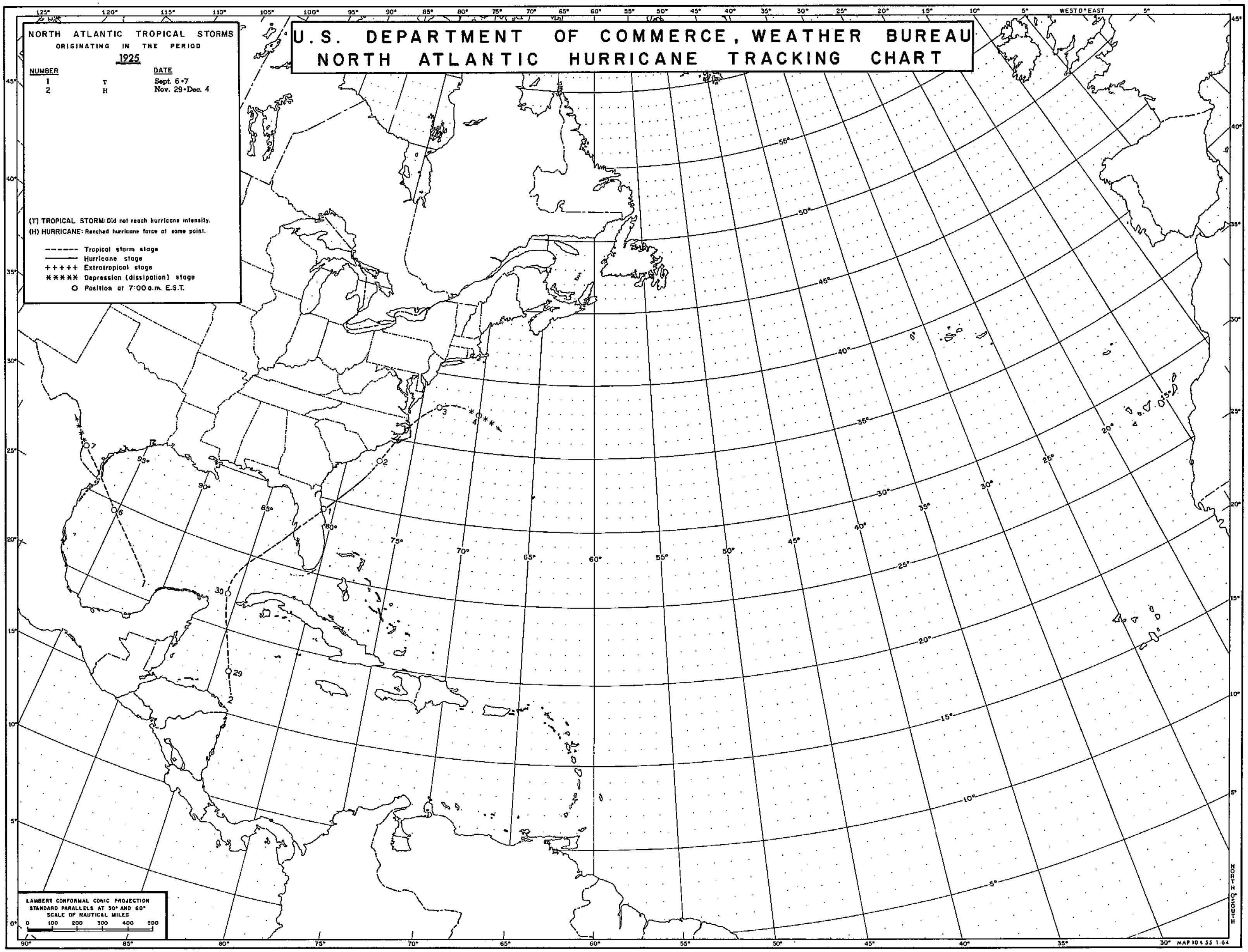

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1921
NUMBER
DATE
1 H June 15-26
2 H Sept. 6-7
3 H Sept. 8-16
4 T Sept. 10-13
5 T Oct. 16-23
6 H Oct. 20-29
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

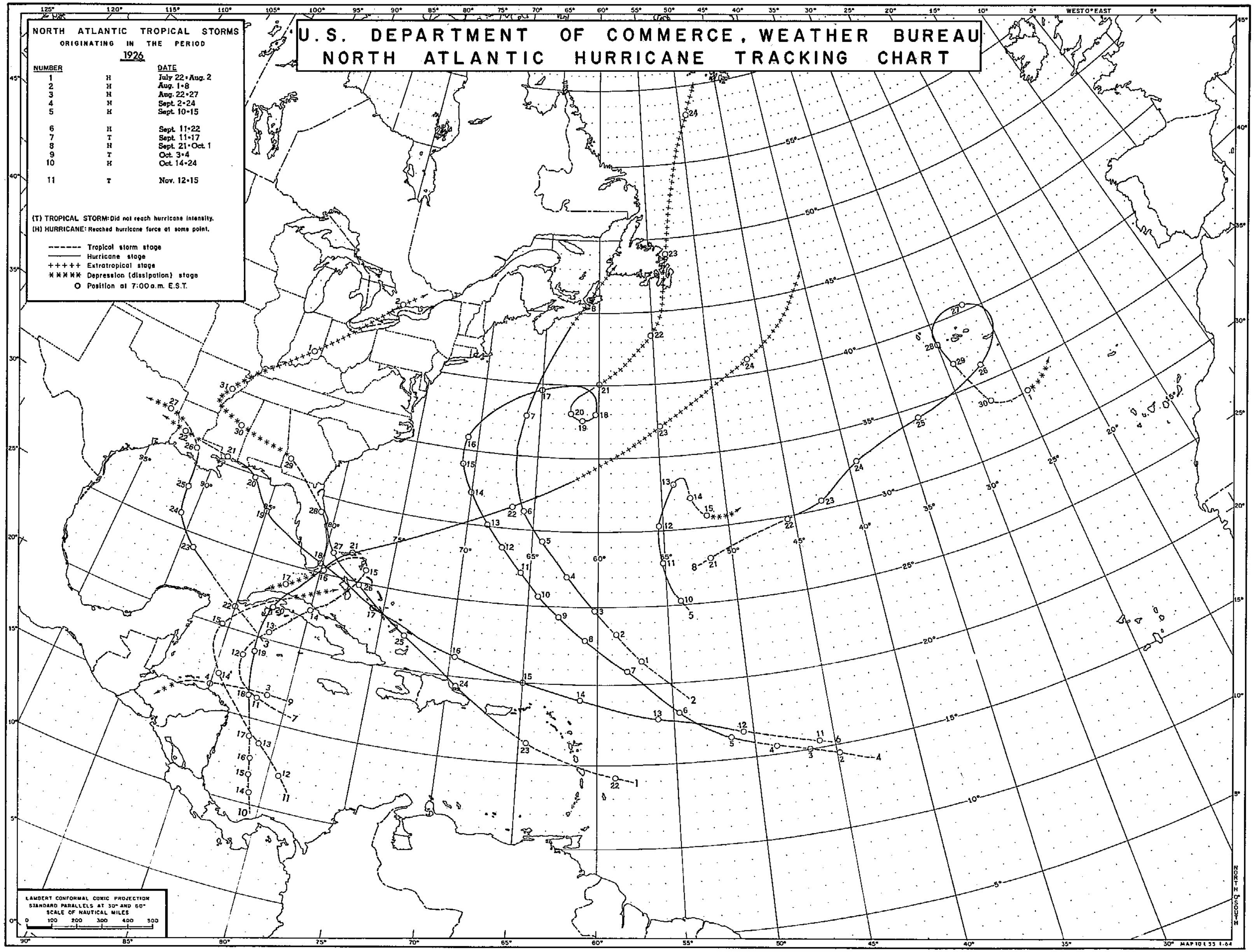

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1922
NUMBER DATE
1 T June 12-16
2 H Sept. 13-26
3 T Oct. 12-17
4 H Oct. 14-21
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

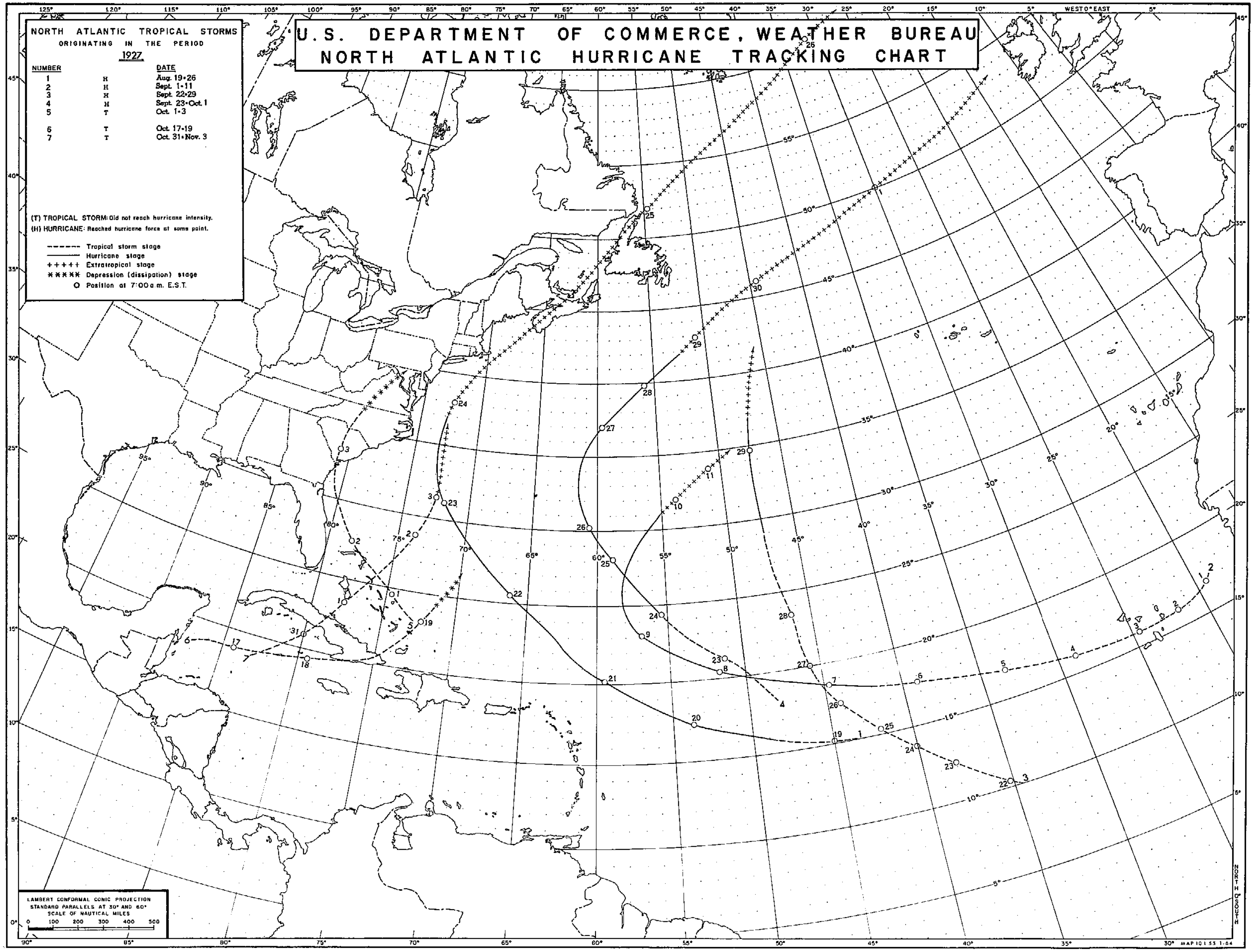


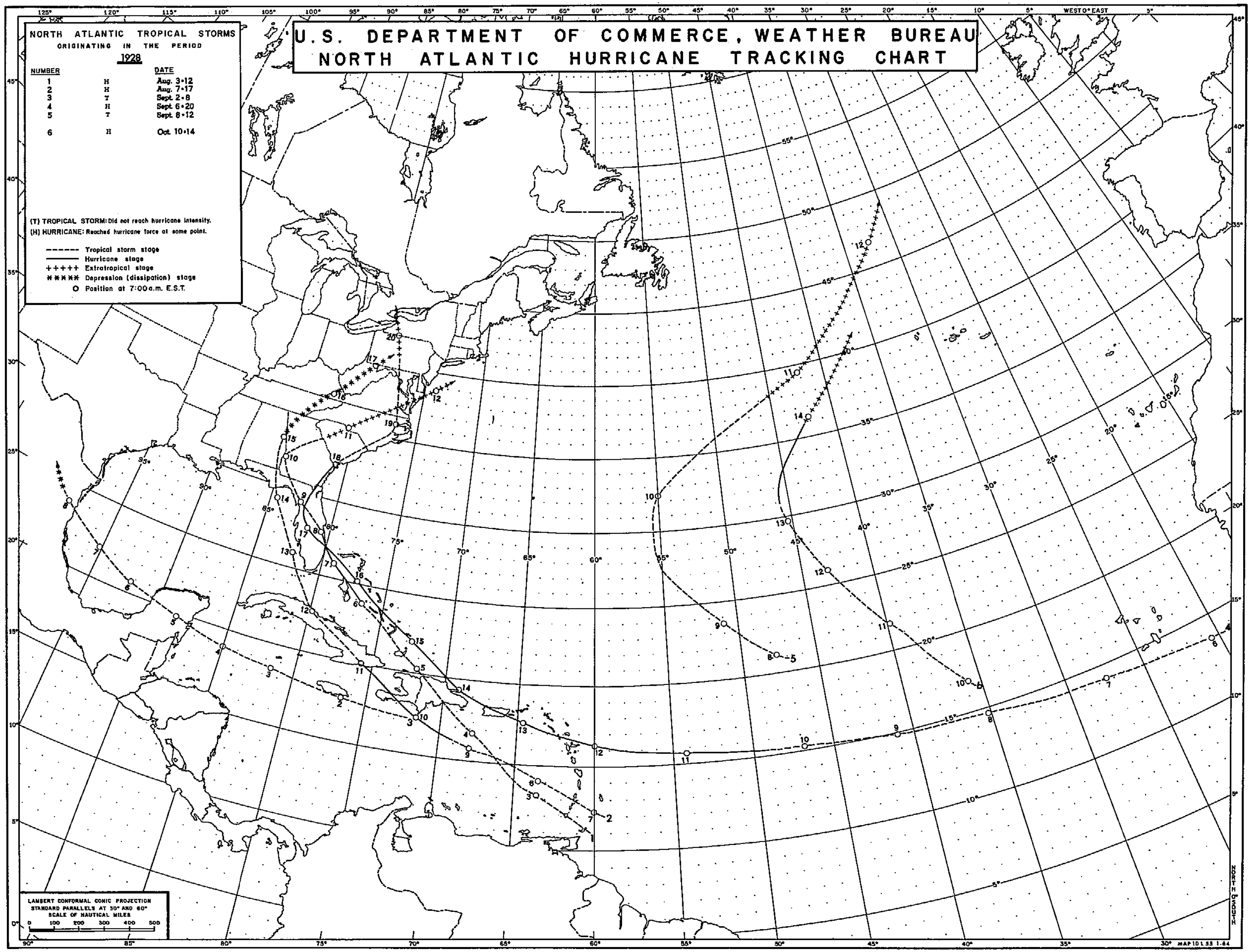
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1923
NUMBER DATE
1 H Aug. 31-Sept. 9
2 H Sept. 24-Oct. 4
3 H Oct. 12-17
4 T Oct. 14-29
5 T Oct. 15-19
6 T Oct. 16-19
7 T Oct. 24-26
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1924
NUMBER
DATE
1 T June 18-21
2 H Aug. 16-28
3 H Aug. 26-Sept. 6
4 H Sept. 13-19
5 T Sept. 27-30
6 T Oct. 12-14
7 H Oct. 14-23
8 H Nov. 5-14
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------- Tropical storm stage
——— Hurricane stage
+++++ Extratropical stage
✱✱✱✱✱ Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

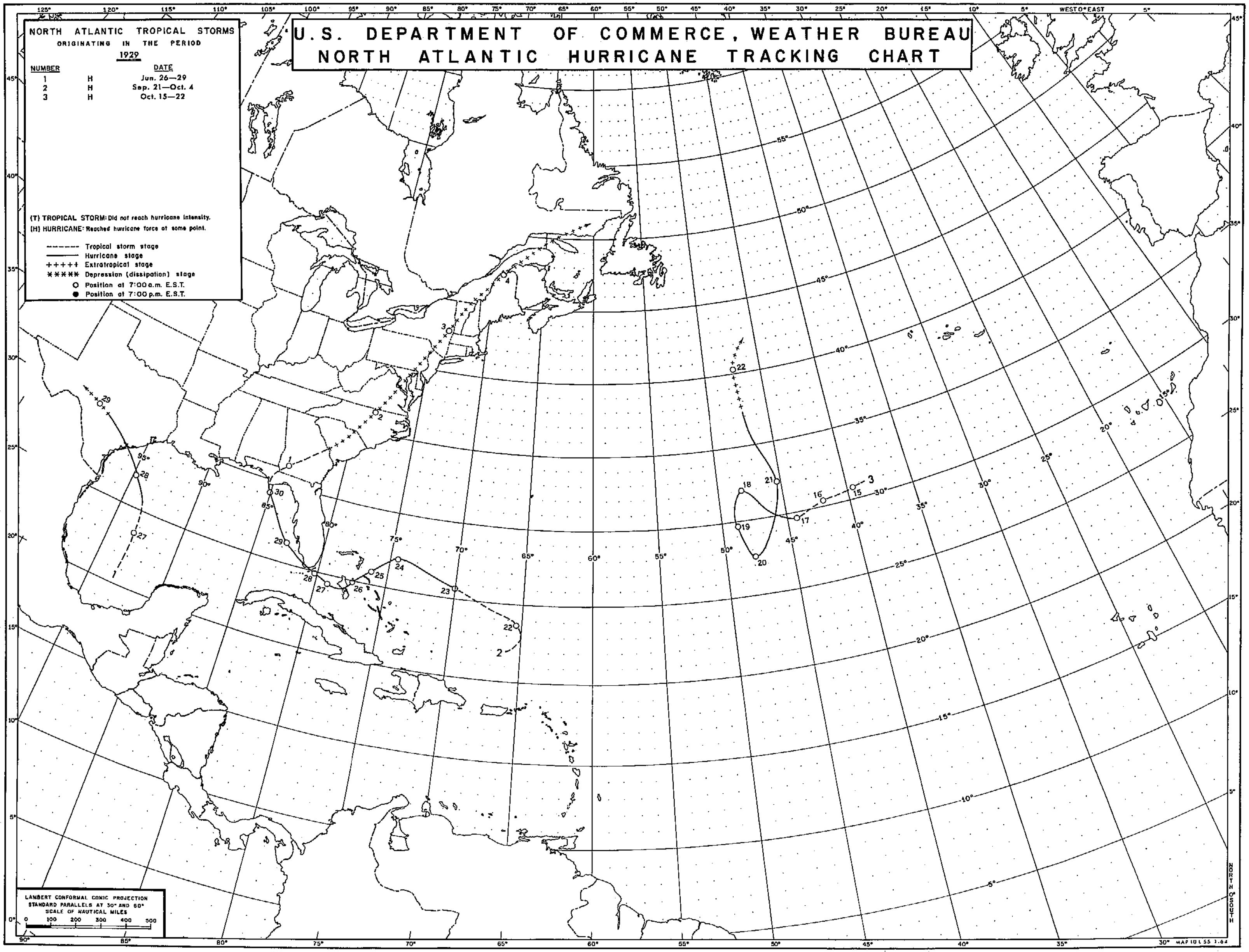

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1925
NUMBER
DATE
1 T Sept. 6-7
2 H Nov. 29-Dec. 4
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH 0° SOUTH
MAP 10 L 53 1-64

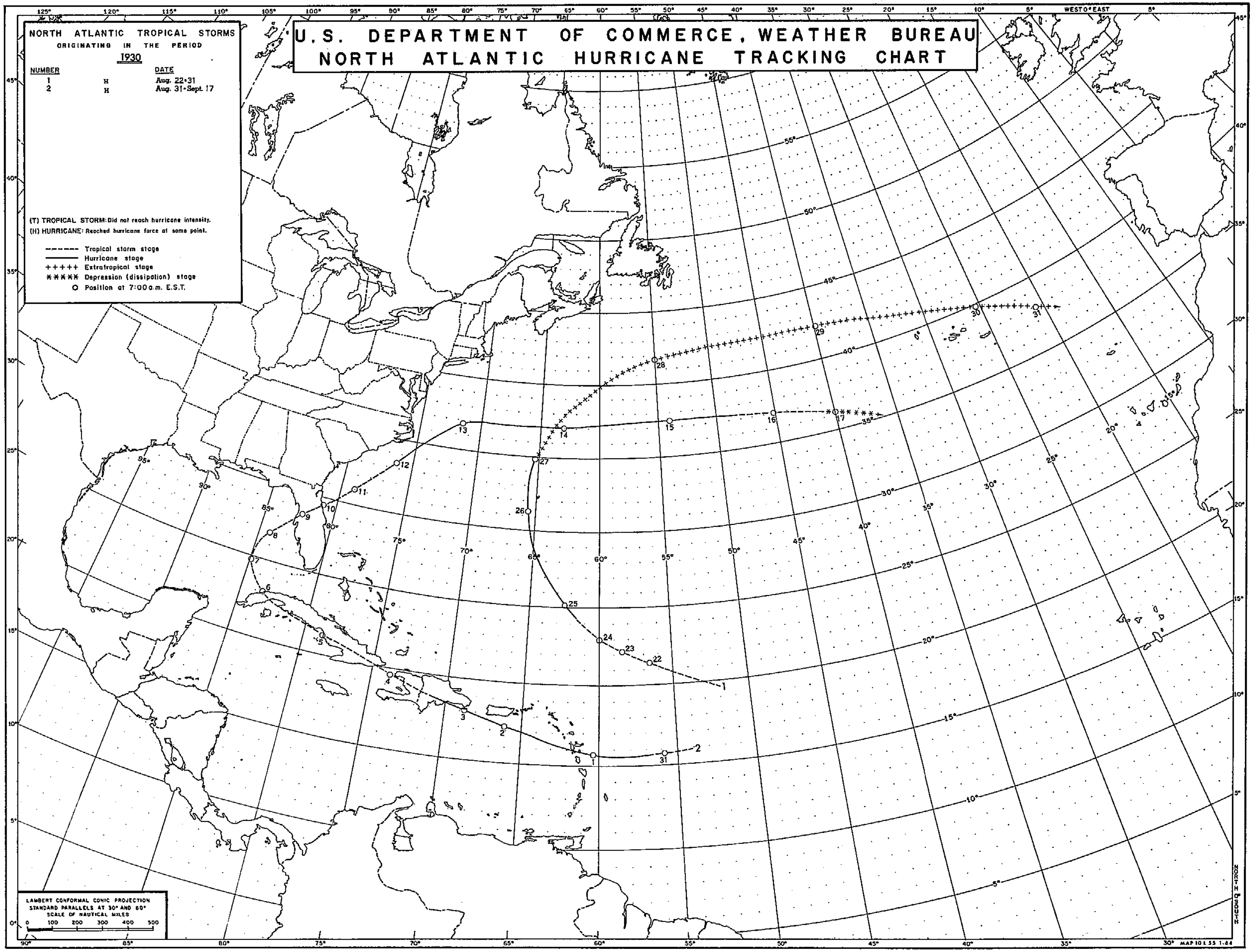

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1926
NUMBER
DATE
1 H July 22-Aug. 2
2 H Aug. 1-8
3 H Aug. 22-27
4 H Sept. 2-24
5 H Sept. 10-15
6 H Sept. 11-22
7 T Sept. 11-17
8 H Sept. 21-Oct. 1
9 T Oct. 3-4
10 H Oct. 14-24
11 T Nov. 12-15
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

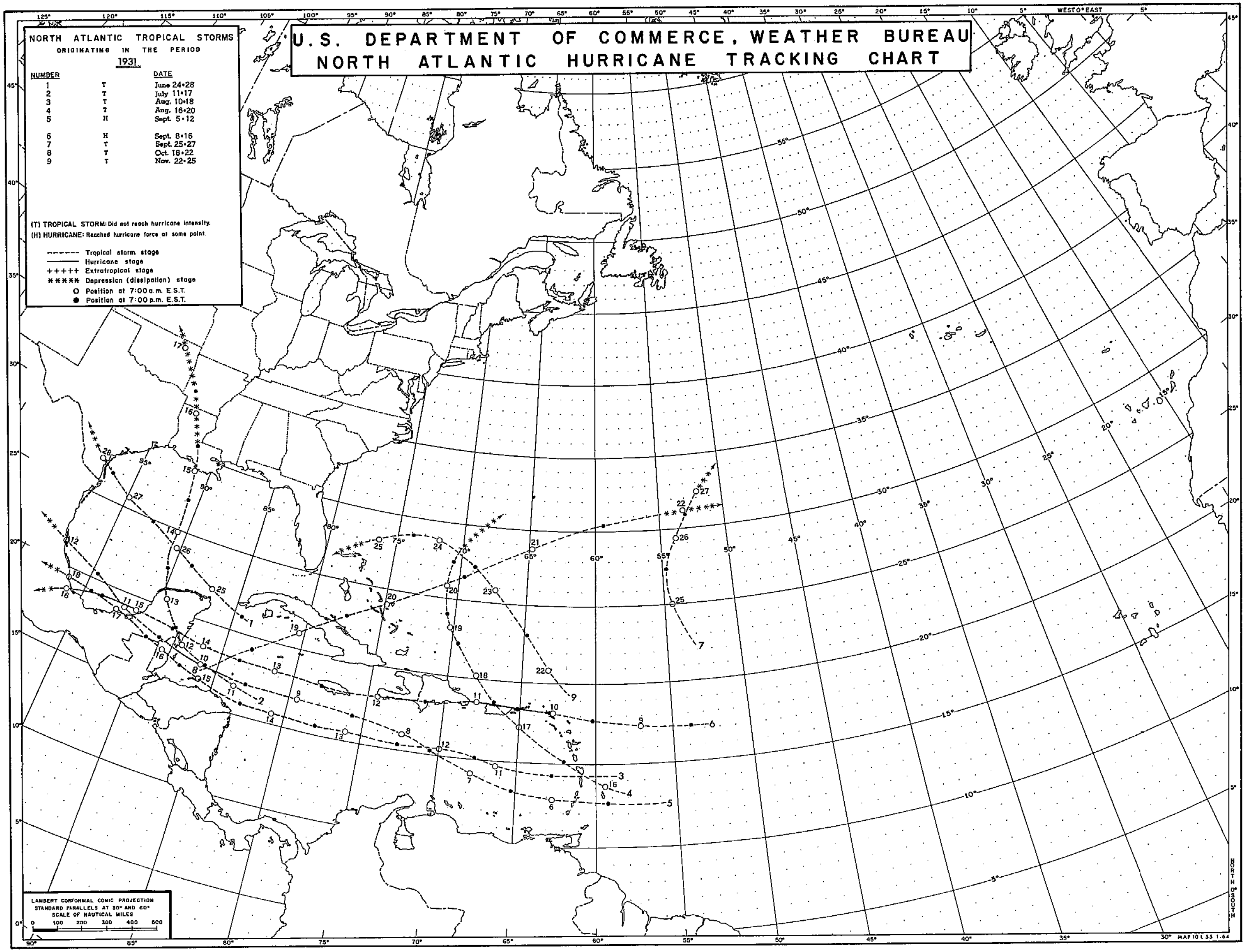

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1927
NUMBER DATE
1 H Aug. 19-26
2 H Sept. 1-11
3 H Sept. 22-29
4 H Sept. 23-Oct. 1
5 T Oct. 1-3
6 T Oct. 17-19
7 T Oct. 31-Nov. 3
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

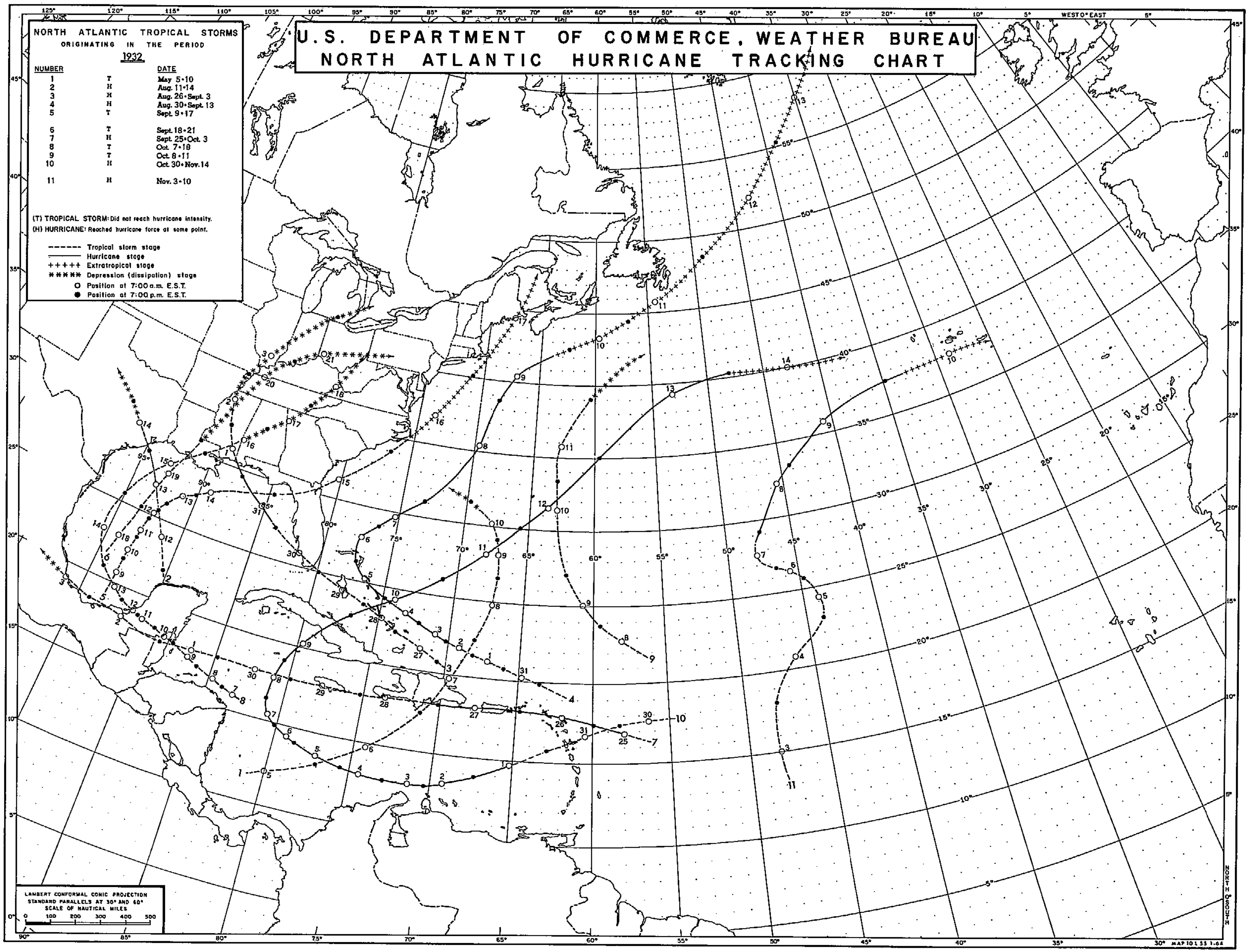


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1928
NUMBER
DATE
1 H Aug. 3-12
2 H Aug. 7-17
3 T Sept. 2-8
4 H Sept. 6-20
5 T Sept. 8-12
6 H Oct. 10-14
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

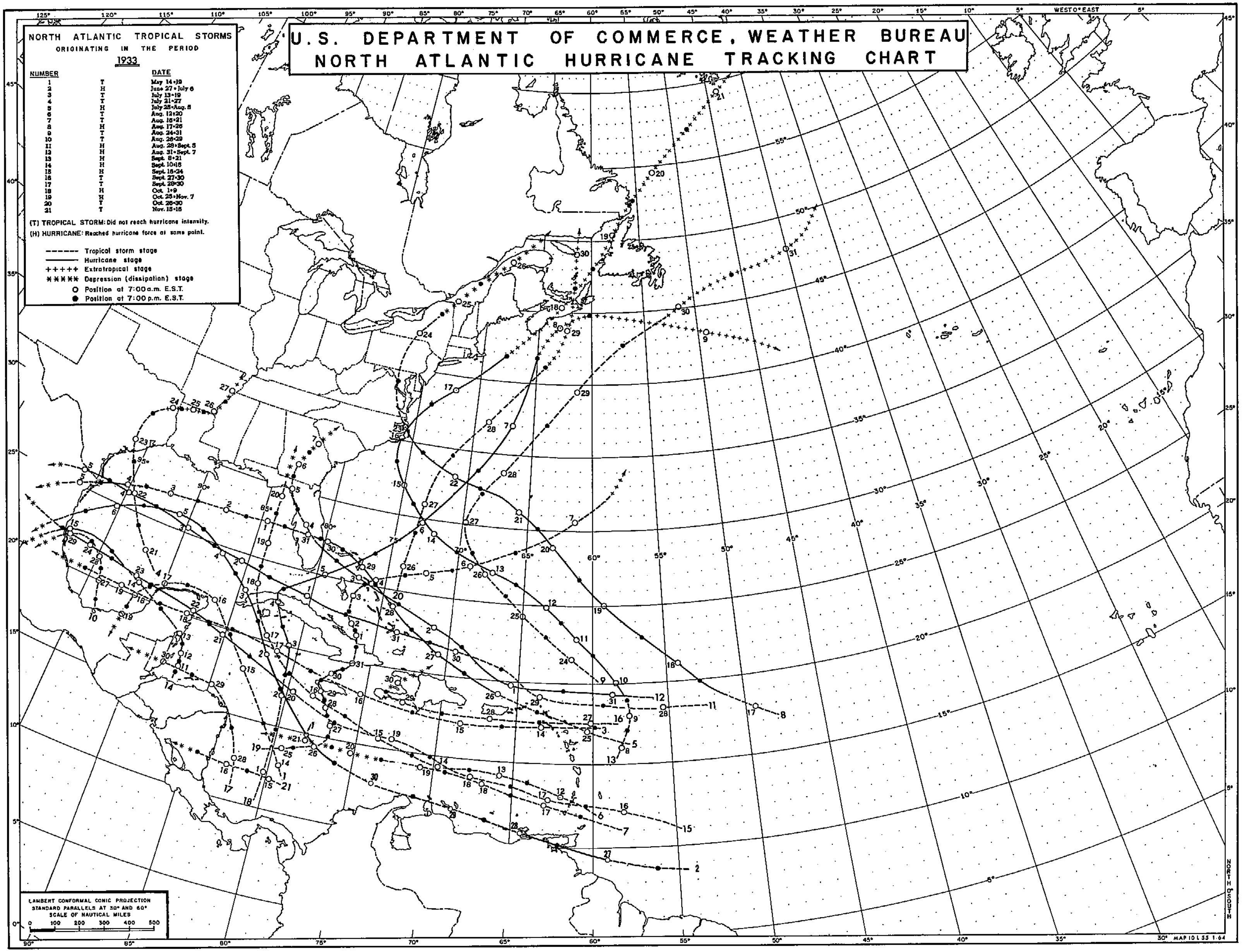

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1929
NUMBER DATE
1 H Jun. 26—29
2 H Sep. 21—Oct. 4
3 H Oct. 15—22
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
—— Hurricane stage
+++++ Extratropical stage
✱✱✱✱✱ Depression (dissipation) stage
○ Position at 7:00 a.m. E.S.T.
● Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

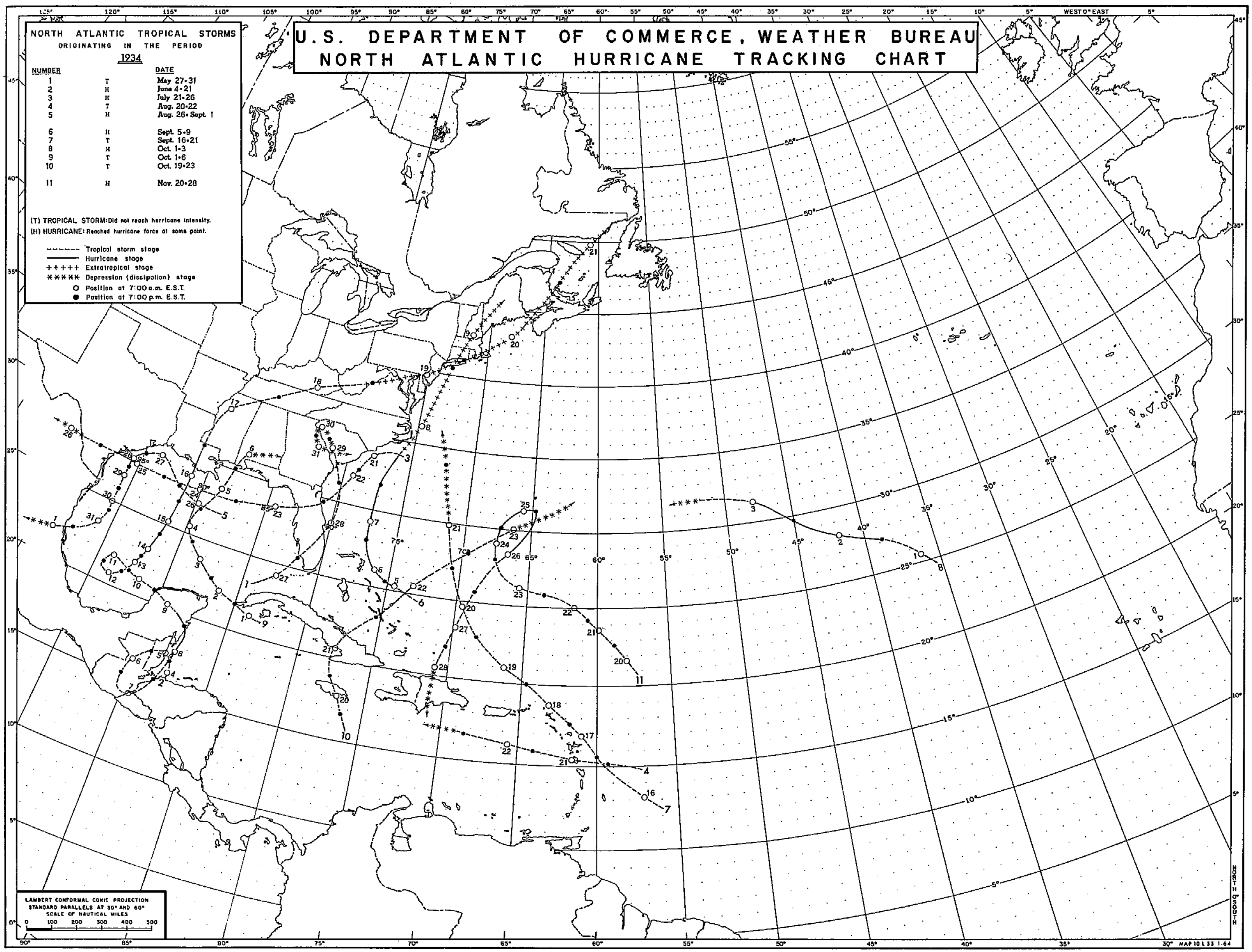

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1930
NUMBER DATE
1 H Aug. 22-31
2 H Aug. 31-Sept. 17
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1931
NUMBER
DATE
1 T June 24-28
2 T July 11-17
3 T Aug. 10-18
4 T Aug. 16-20
5 H Sept. 5-12
6 H Sept. 8-16
7 T Sept. 25-27
8 T Oct. 18-22
9 T Nov. 22-25
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
● Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

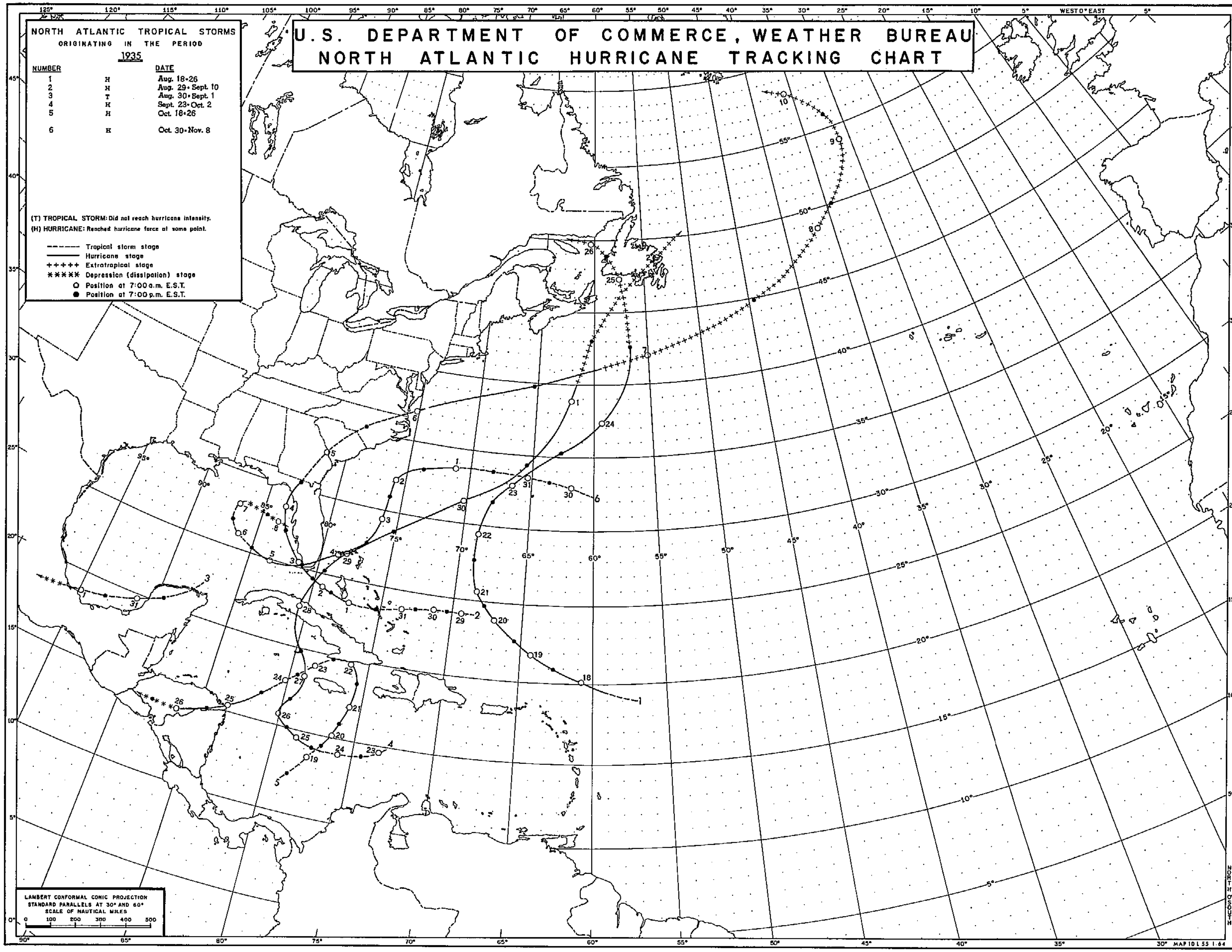


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1932
NUMBER DATE
1 T May 5-10
2 H Aug. 11-14
3 H Aug. 26-Sept. 3
4 H Aug. 30-Sept. 13
5 T Sept. 9-17
6 T Sept. 18-21
7 H Sept. 25-Oct. 3
8 T Oct. 7-18
9 T Oct. 8-11
10 H Oct. 30-Nov. 14
11 H Nov. 3-10
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
++++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
● Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

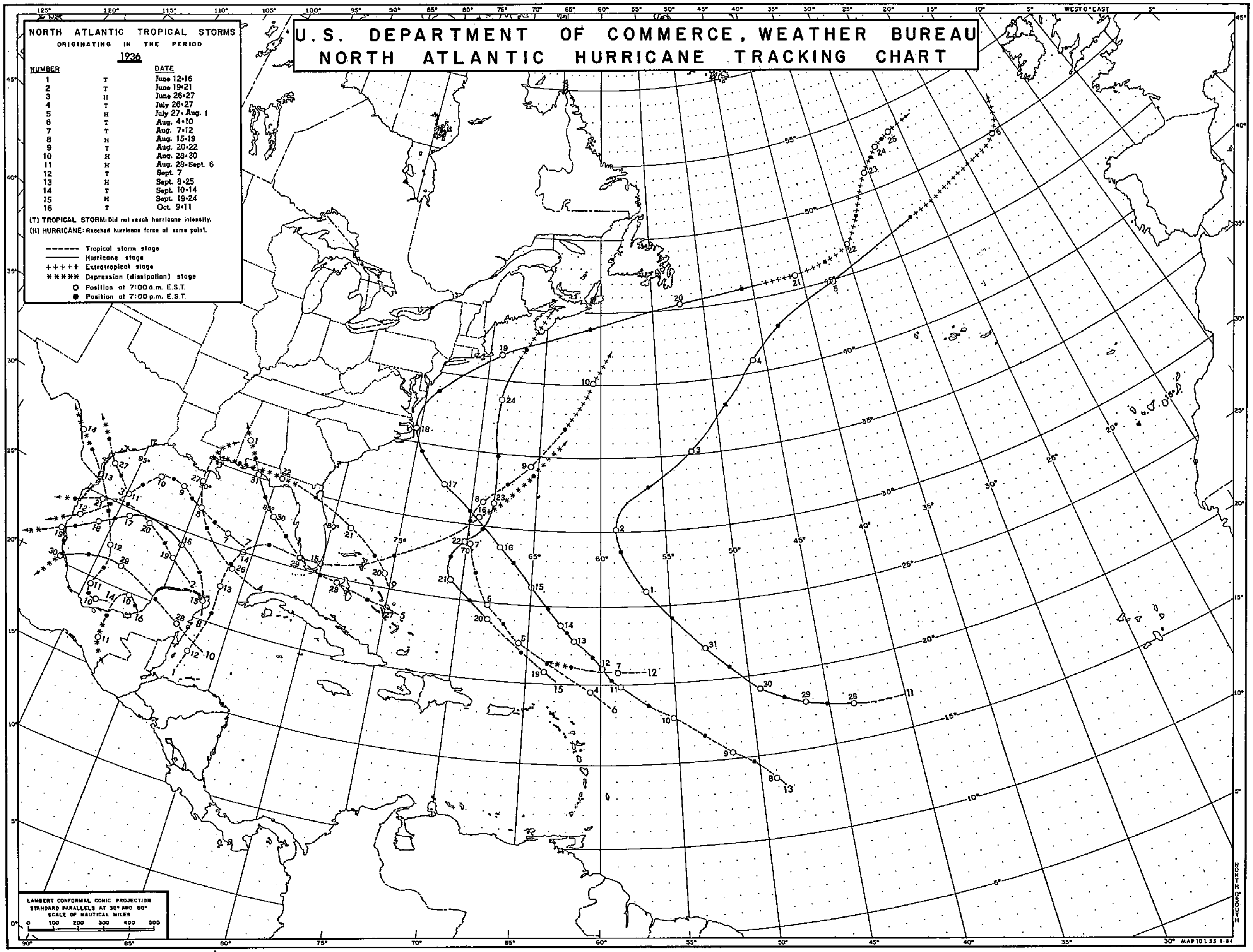

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1933
NUMBER DATE
1 T May 14-19
2 H June 27-July 6
3 T July 13-19
4 T July 21-27
5 H July 25-Aug. 5
6 T Aug. 12-20
7 T Aug. 15-21
8 H Aug. 17-26
9 T Aug. 24-31
10 T Aug. 26-29
11 H Aug. 28-Sept. 5
12 H Aug. 31-Sept. 7
13 H Sept. 8-21
14 H Sept. 10-16
15 H Sept. 16-24
16 T Sept. 27-30
17 T Sept. 28-30
18 H Oct. 1-9
19 H Oct. 25-Nov. 7
20 T Oct. 26-30
21 T Nov. 15-16
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH SOUTH
MAP 10 L S S 1-64

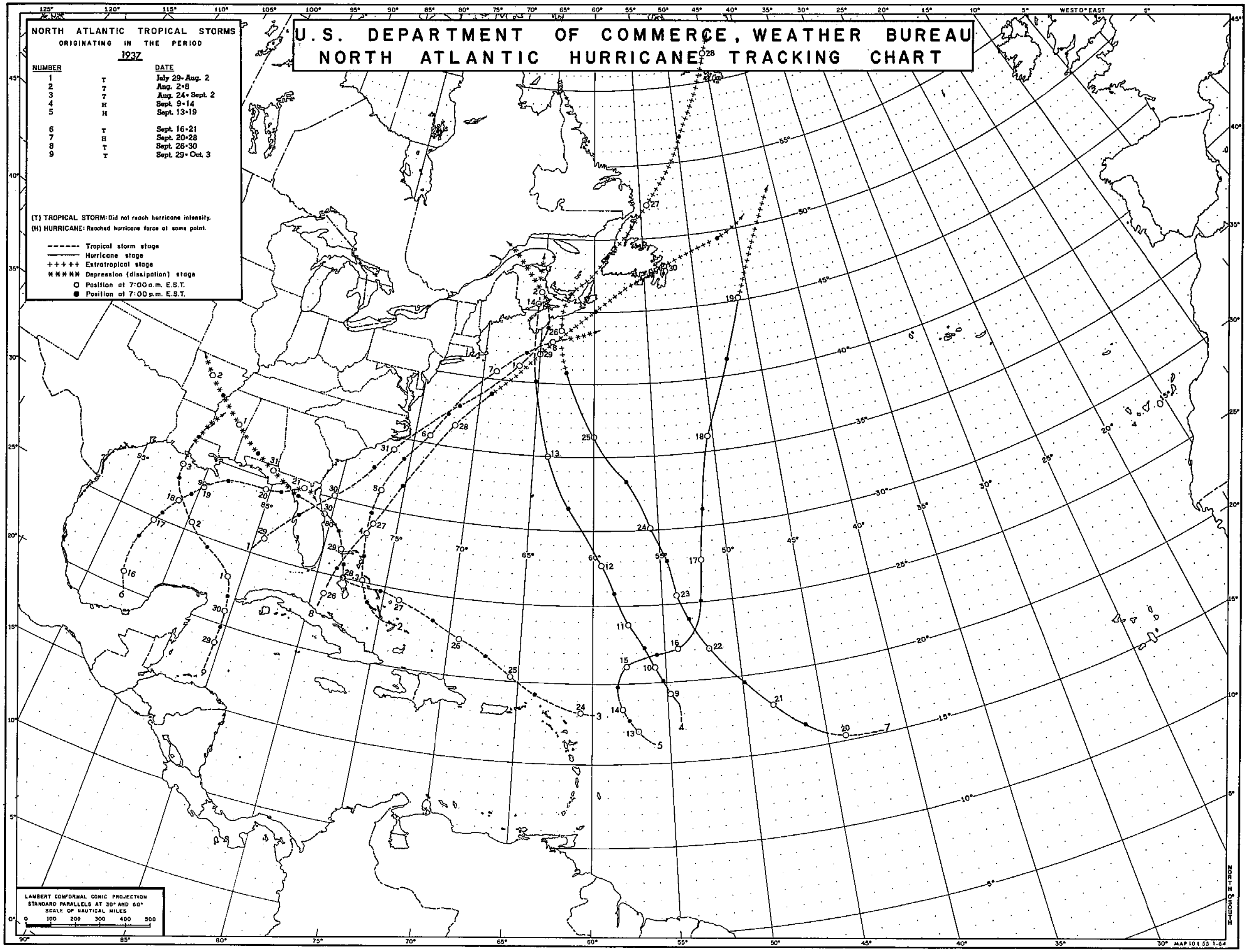


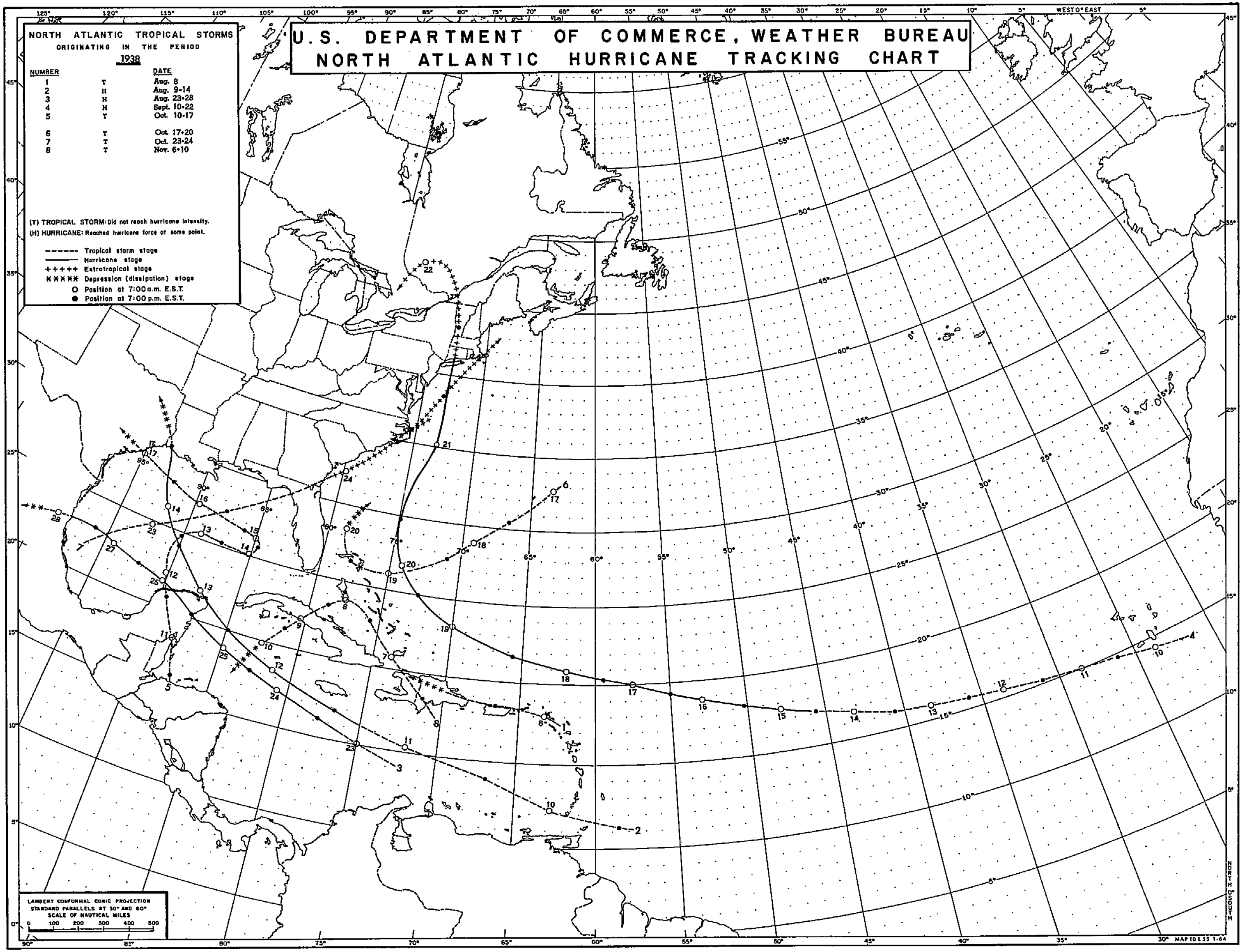
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1934
NUMBER DATE
1 T May 27-31
2 H June 4-21
3 H July 21-26
4 T Aug. 20-22
5 H Aug. 26-Sept. 1
6 H Sept. 5-9
7 T Sept. 16-21
8 H Oct. 1-3
9 T Oct. 1-6
10 T Oct. 19-23
11 H Nov. 20-28
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

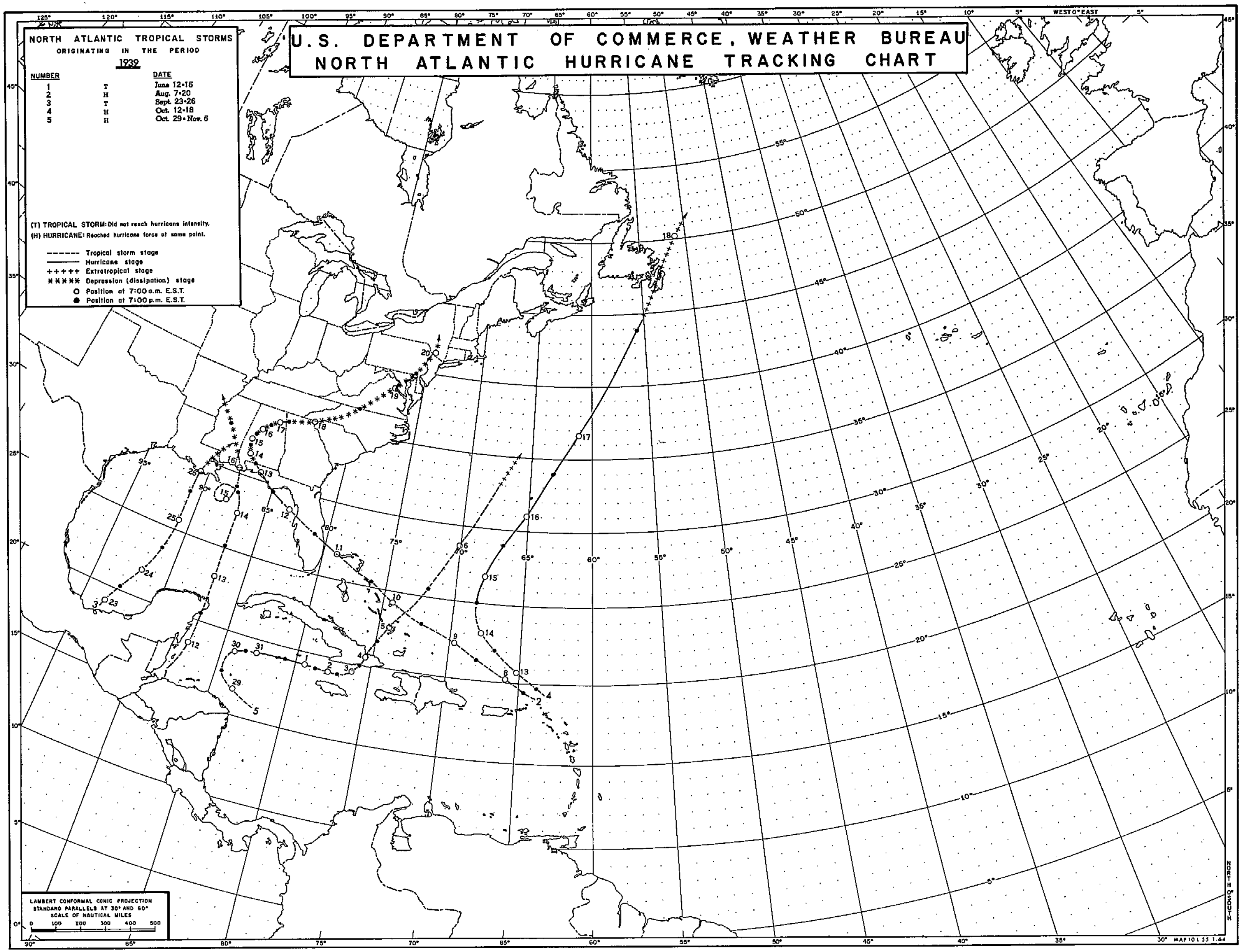


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1935
NUMBER
DATE
1 H Aug. 18-26
2 H Aug. 29-Sept. 10
3 T Aug. 30-Sept. 1
4 H Sept. 23-Oct. 2
5 H Oct. 18-26
6 H Oct. 30-Nov. 8
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 55 1-64

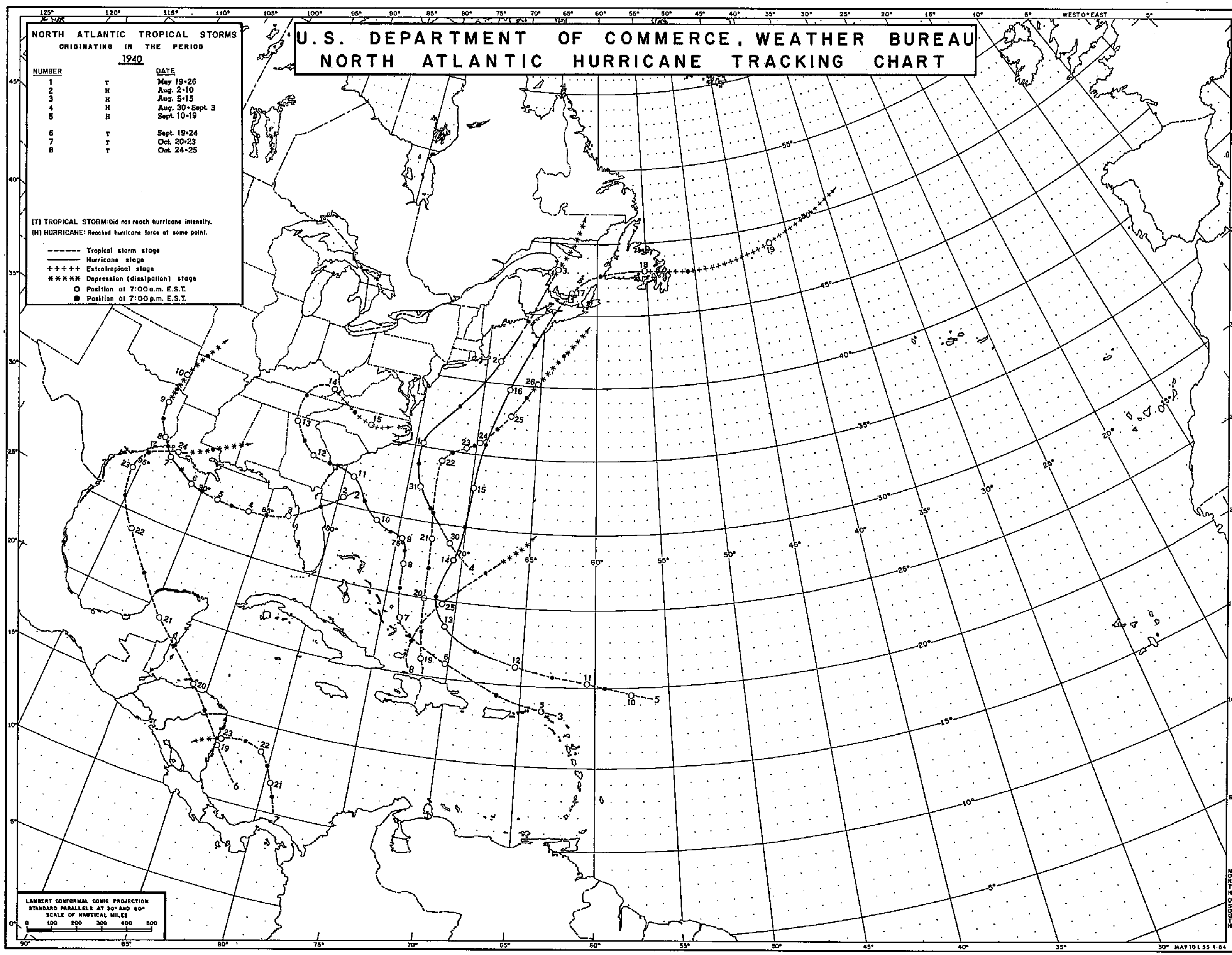

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1936
NUMBER DATE
1 T June 12-16
2 T June 19-21
3 H June 26-27
4 T July 26-27
5 H July 27-Aug. 1
6 T Aug. 4-10
7 T Aug. 7-12
8 H Aug. 15-19
9 T Aug. 20-22
10 H Aug. 28-30
11 H Aug. 28-Sept. 6
12 T Sept. 7
13 H Sept. 8-25
14 T Sept. 10-14
15 H Sept. 19-24
16 T Oct. 9-11
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
—— Hurricane stage
+++++ Extratropical stage
✱✱✱✱✱ Depression (dissipation) stage
○ Position at 7:00 a.m. E.S.T.
● Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 101 33 1-64

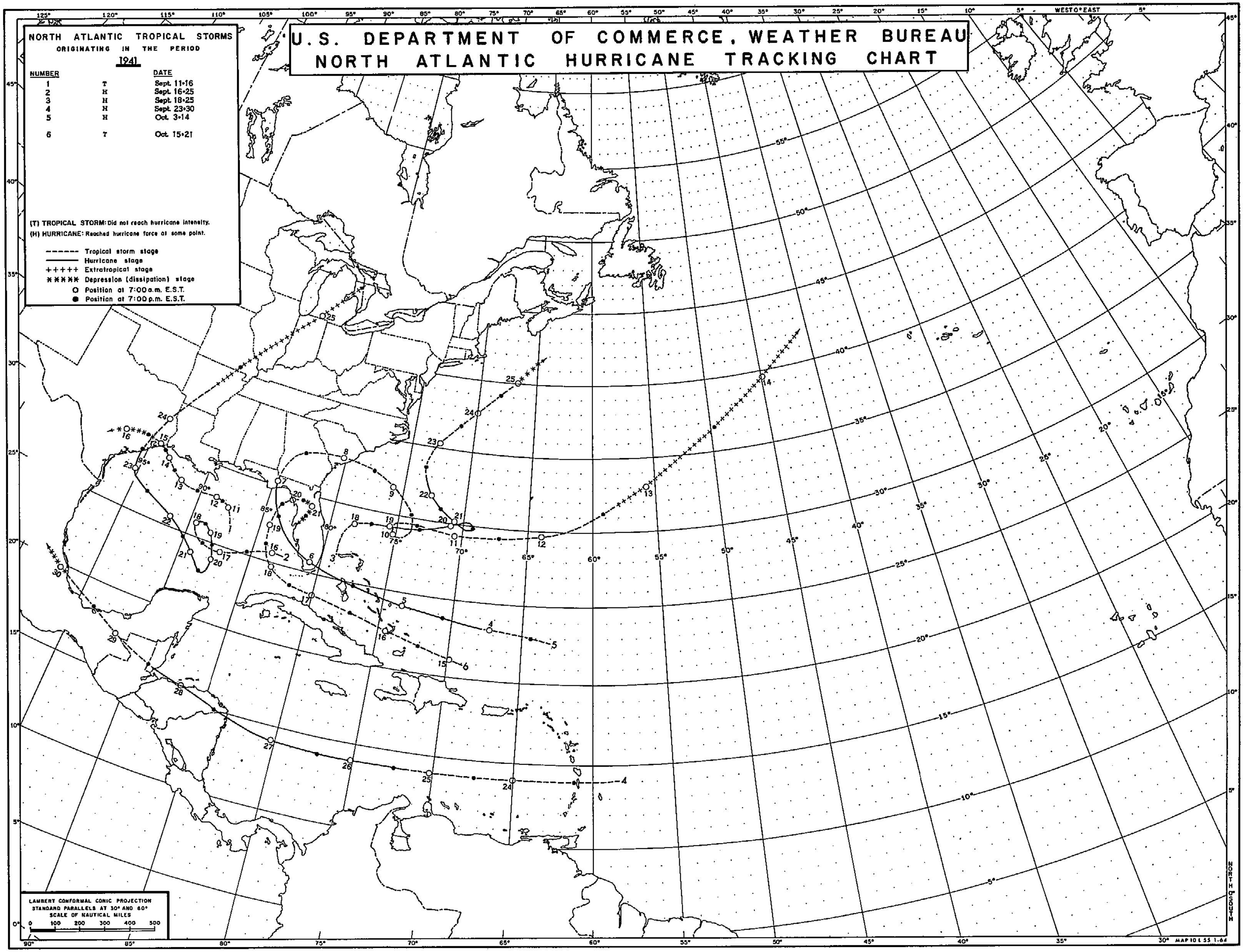

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1937
NUMBER
DATE
1 T July 29-Aug. 2
2 T Aug. 2-8
3 T Aug. 24-Sept. 2
4 H Sept. 9-14
5 H Sept. 13-19
6 T Sept. 16-21
7 H Sept. 20-28
8 T Sept. 26-30
9 T Sept. 29-Oct. 3
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

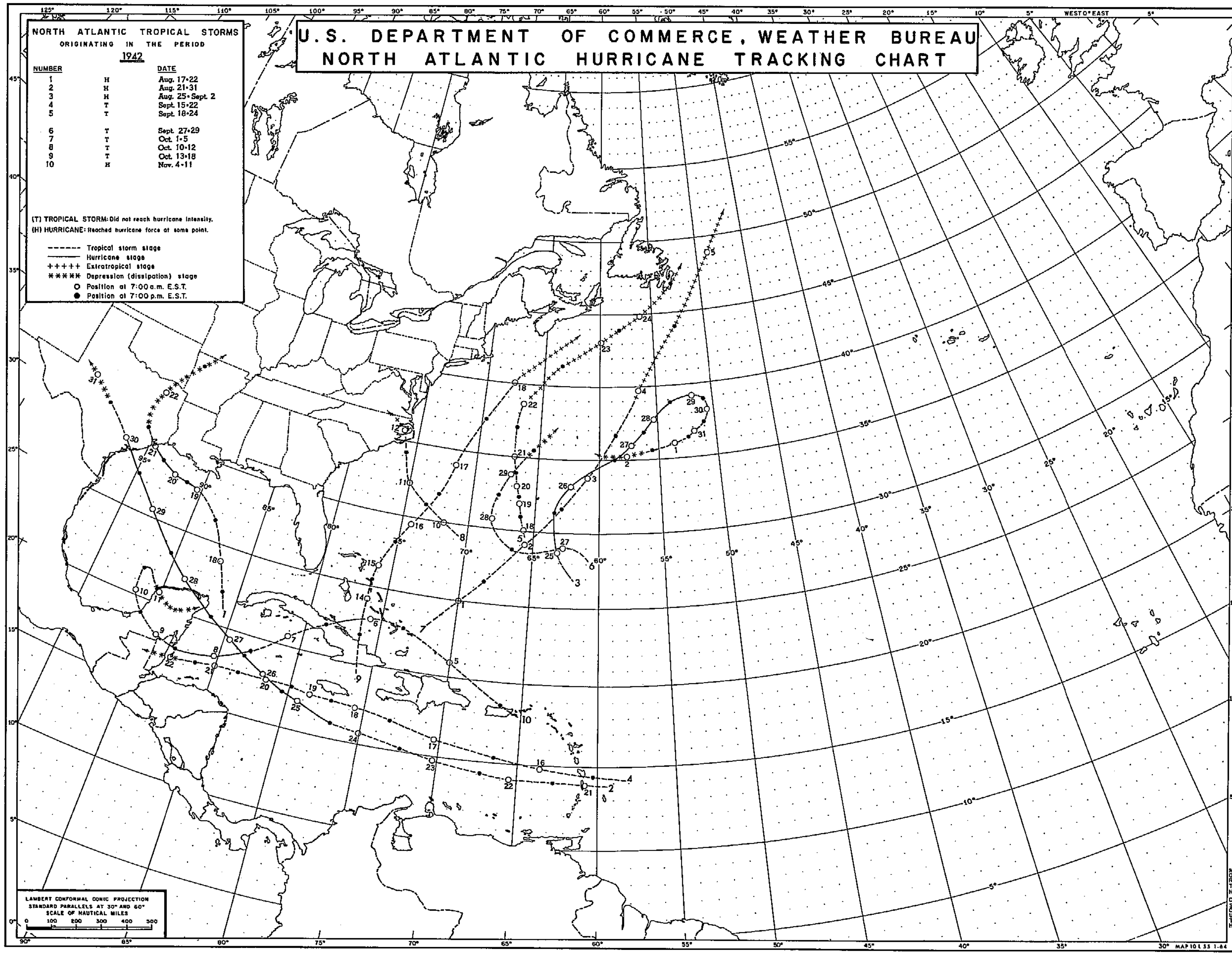

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1938
NUMBER DATE
1 T Aug. 8
2 H Aug. 9-14
3 H Aug. 23-28
4 H Sept. 10-22
5 T Oct. 10-17
6 T Oct. 17-20
7 T Oct. 23-24
8 T Nov. 6-10
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

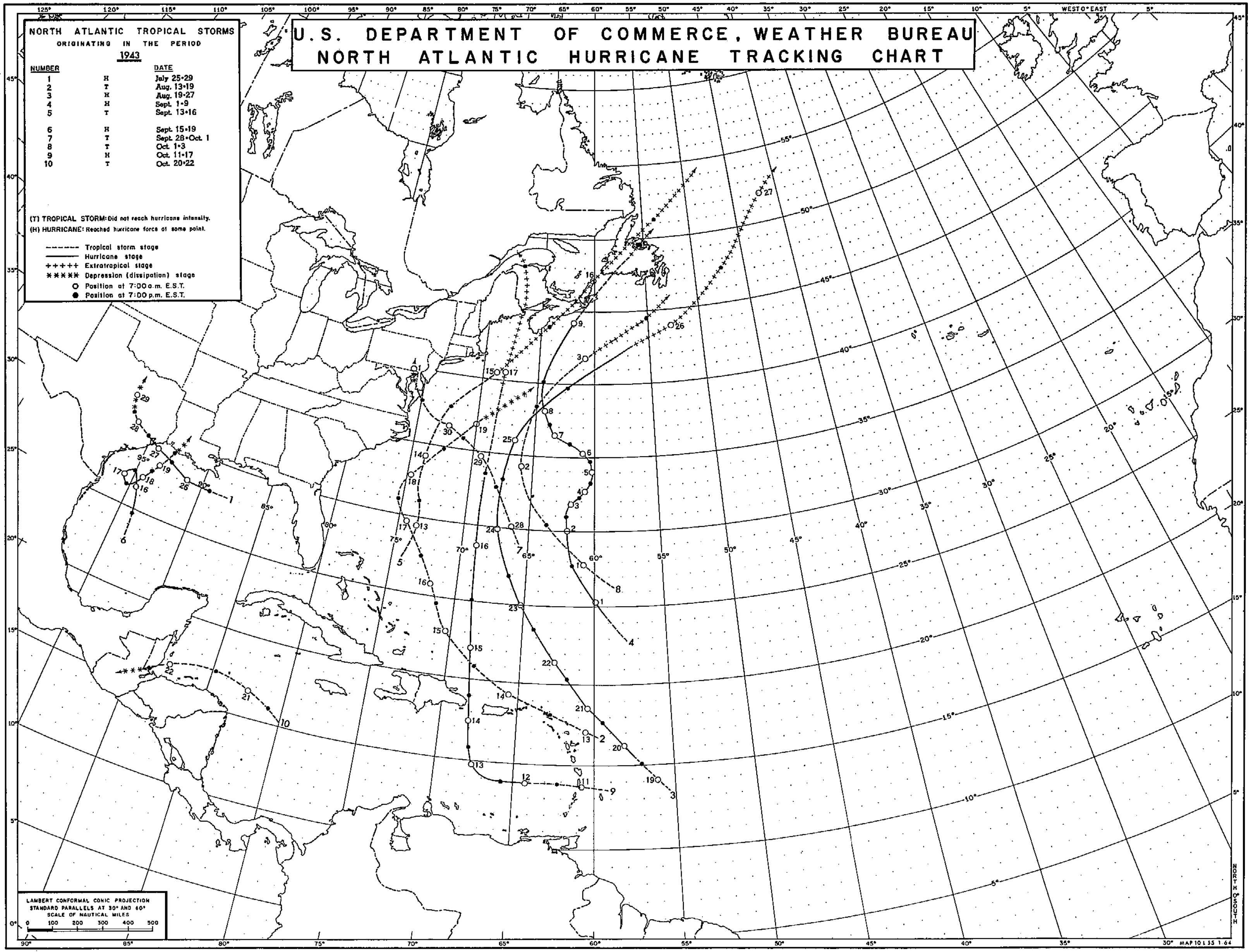


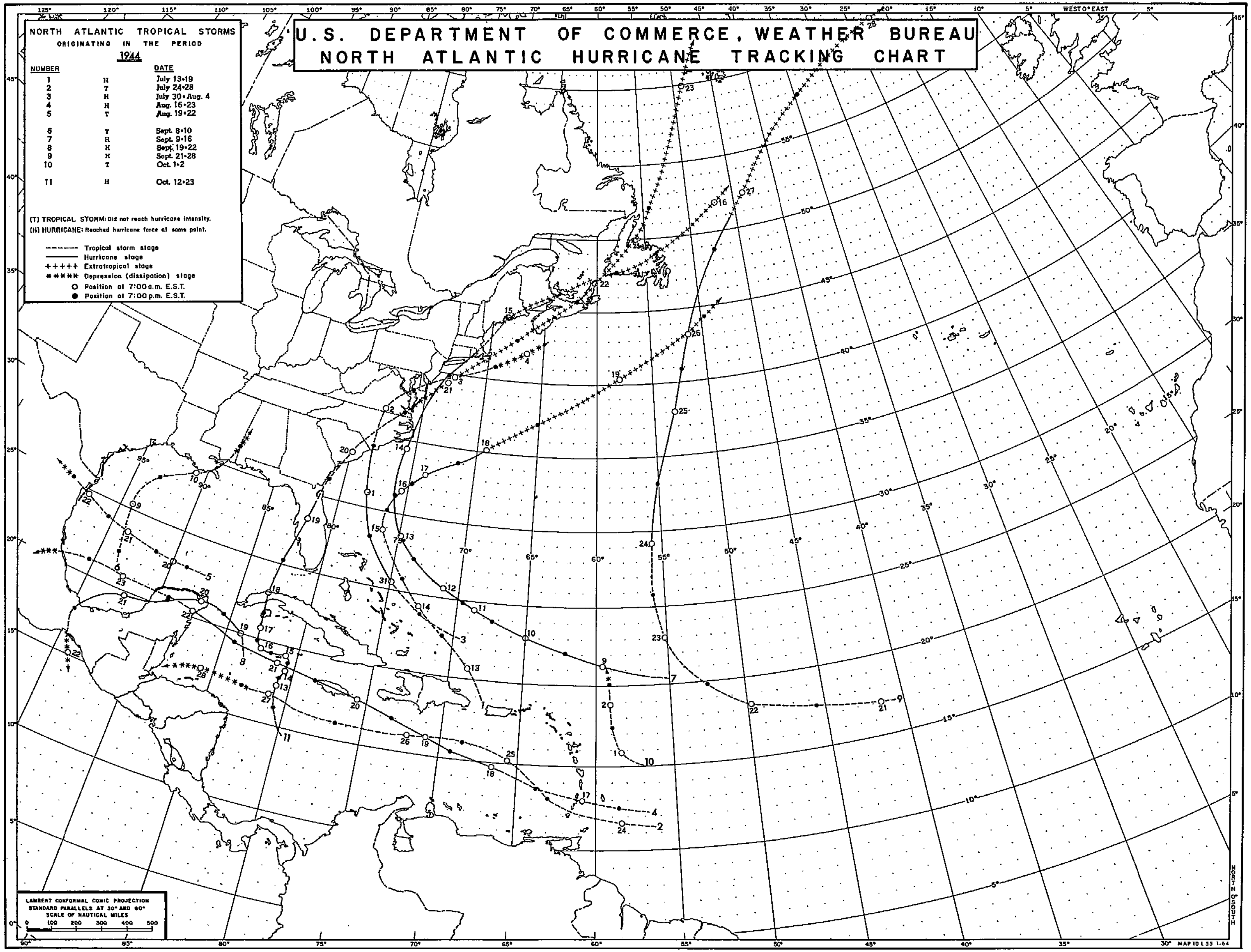
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1939
NUMBER
DATE
1 T June 12-16
2 H Aug. 7-20
3 T Sept. 23-26
4 H Oct. 12-18
5 H Oct. 29 - Nov. 6
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
——— Hurricane stage
+++++ Extratropical stage
✱✱✱✱✱ Depression (dissipation) stage
○ Position at 7:00 a.m. E.S.T.
● Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

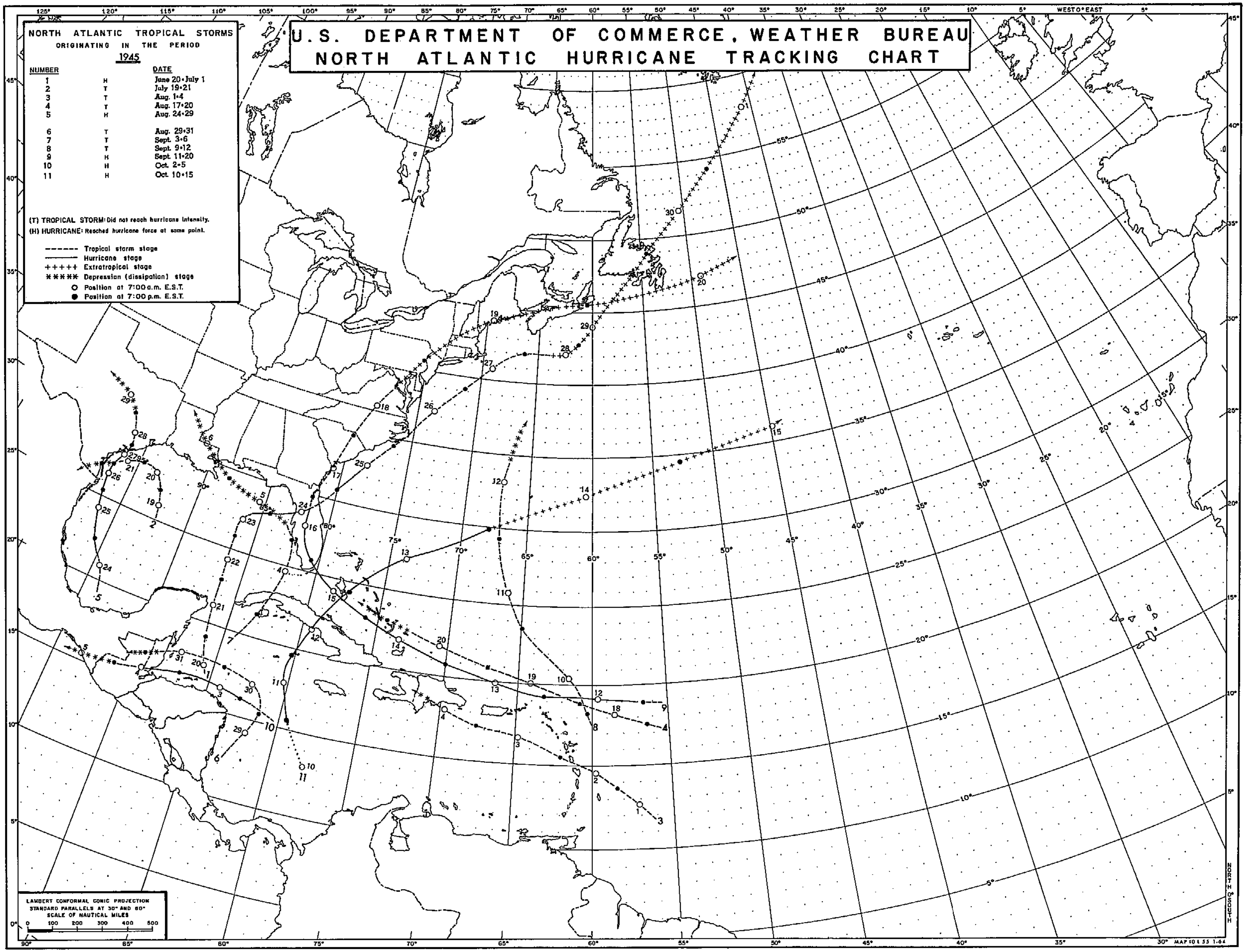

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1940
NUMBER
DATE
1 T May 19-26
2 H Aug. 2-10
3 H Aug. 5-15
4 H Aug. 30-Sept. 3
5 H Sept. 10-19
6 T Sept. 19-24
7 T Oct. 20-23
8 T Oct. 24-25
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

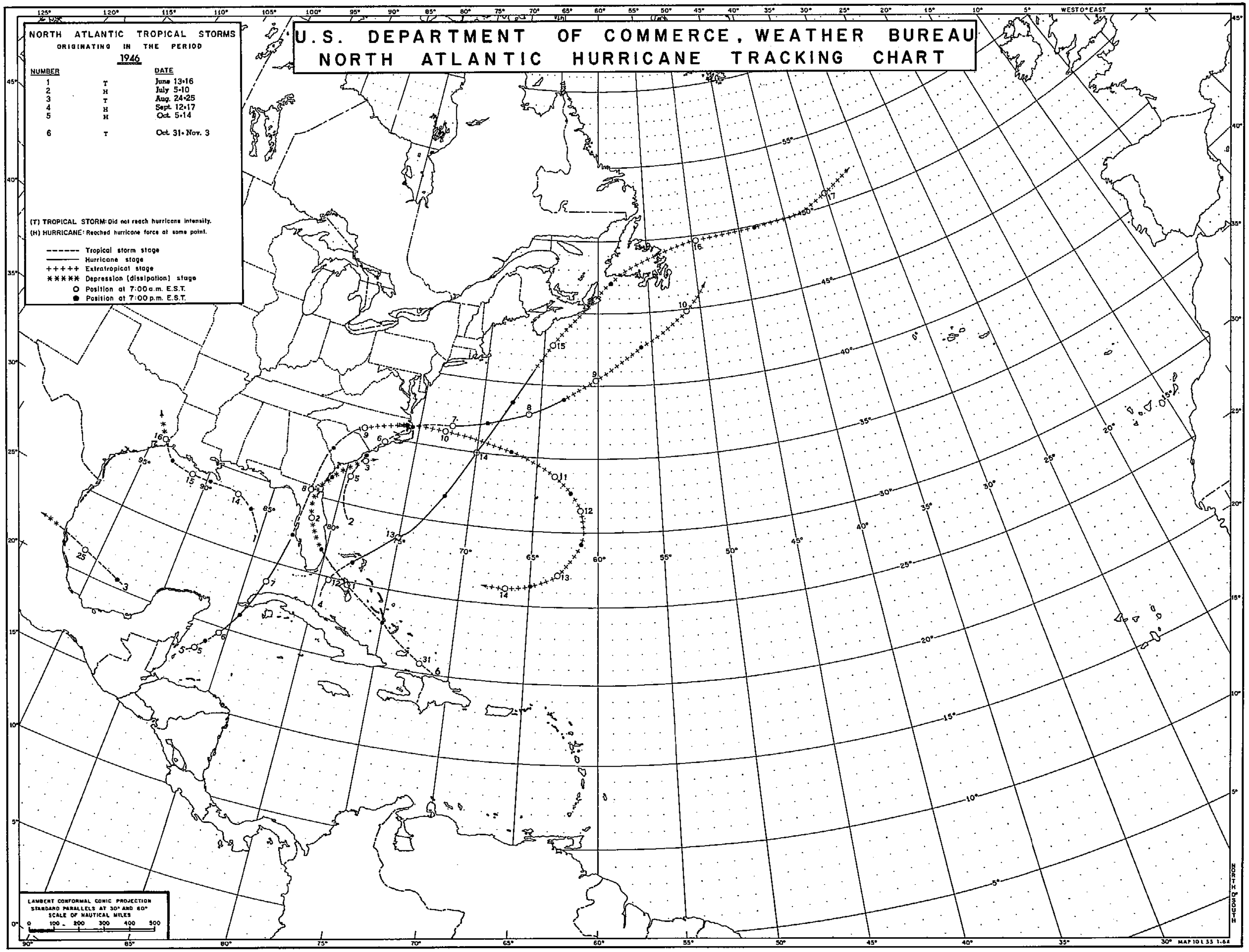

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1941
NUMBER DATE
1 T Sept. 11-16
2 H Sept. 16-25
3 H Sept. 18-25
4 H Sept. 23-30
5 H Oct. 3-14
6 T Oct. 15-21
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

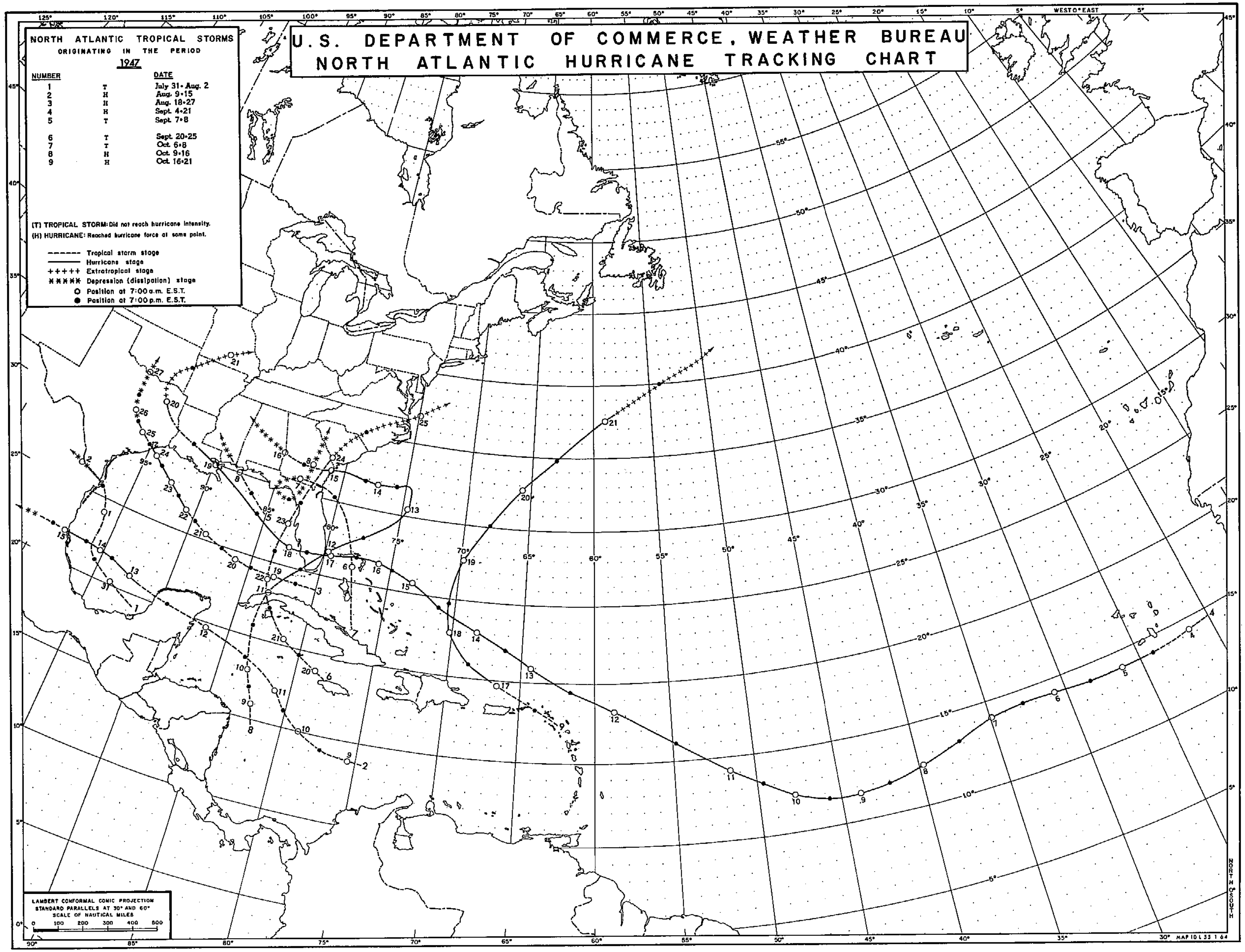

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1942
NUMBER DATE
1 H Aug. 17-22
2 H Aug. 21-31
3 H Aug. 25-Sept. 2
4 T Sept. 15-22
5 T Sept. 18-24
6 T Sept. 27-29
7 T Oct. 1-5
8 T Oct. 10-12
9 T Oct. 13-18
10 H Nov. 4-11
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1943
NUMBER DATE
1 H July 25-29
2 T Aug. 13-19
3 H Aug. 19-27
4 H Sept. 1-9
5 T Sept. 13-16
6 H Sept. 15-19
7 T Sept. 28-Oct. 1
8 T Oct. 1-3
9 H Oct. 11-17
10 T Oct. 20-22
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------- Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

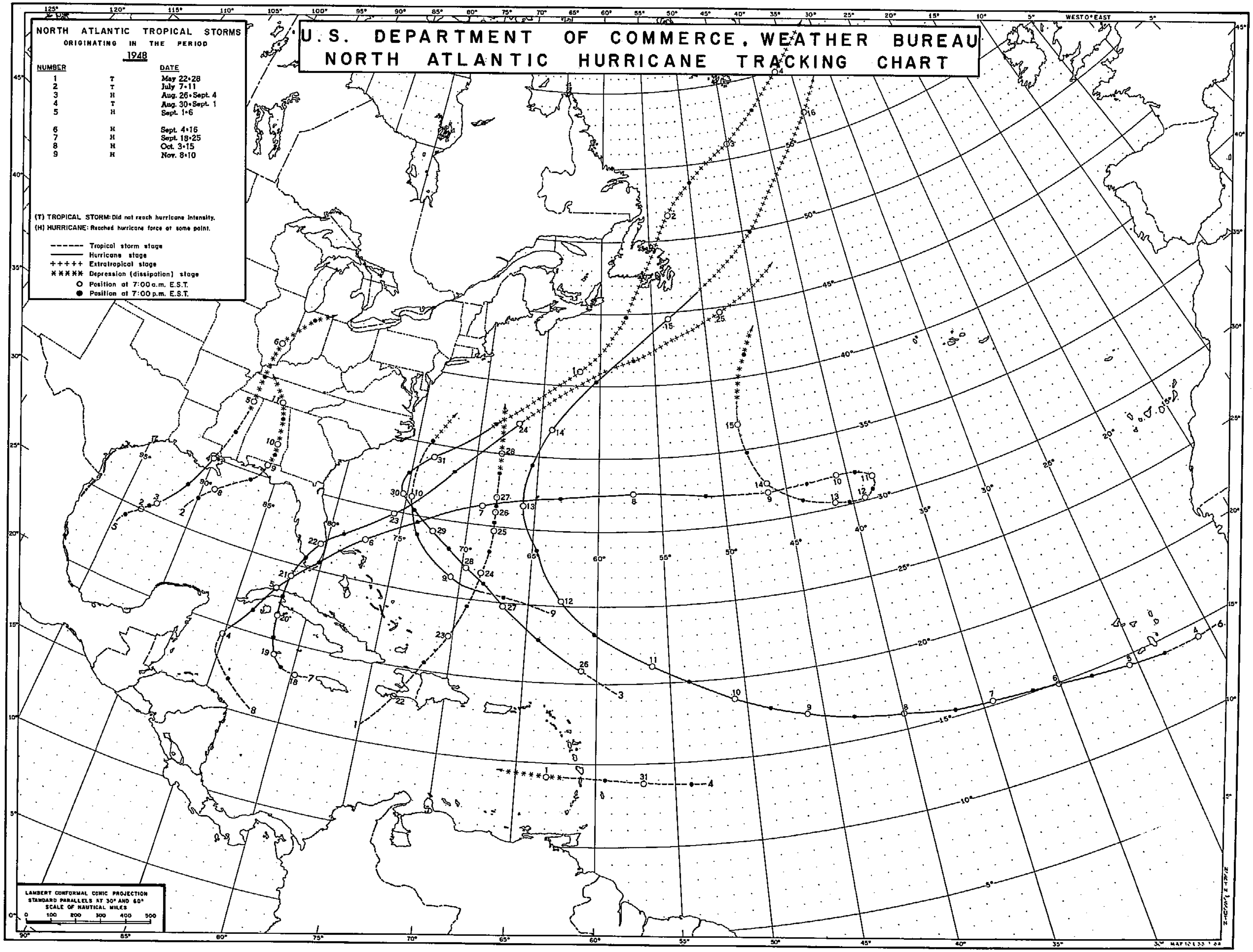

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1944
NUMBER DATE
1 H July 13-19
2 T July 24-28
3 H July 30-Aug. 4
4 H Aug. 16-23
5 T Aug. 19-22
6 T Sept. 8-10
7 H Sept. 9-16
8 H Sept. 19-22
9 H Sept. 21-28
10 T Oct. 1-2
11 H Oct. 12-23
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
+++++ Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1945
NUMBER DATE
1 H June 20-July 1
2 T July 19-21
3 T Aug. 1-4
4 T Aug. 17-20
5 H Aug. 24-29
6 T Aug. 29-31
7 T Sept. 3-6
8 T Sept. 9-12
9 H Sept. 11-20
10 H Oct. 2-5
11 H Oct. 10-15
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

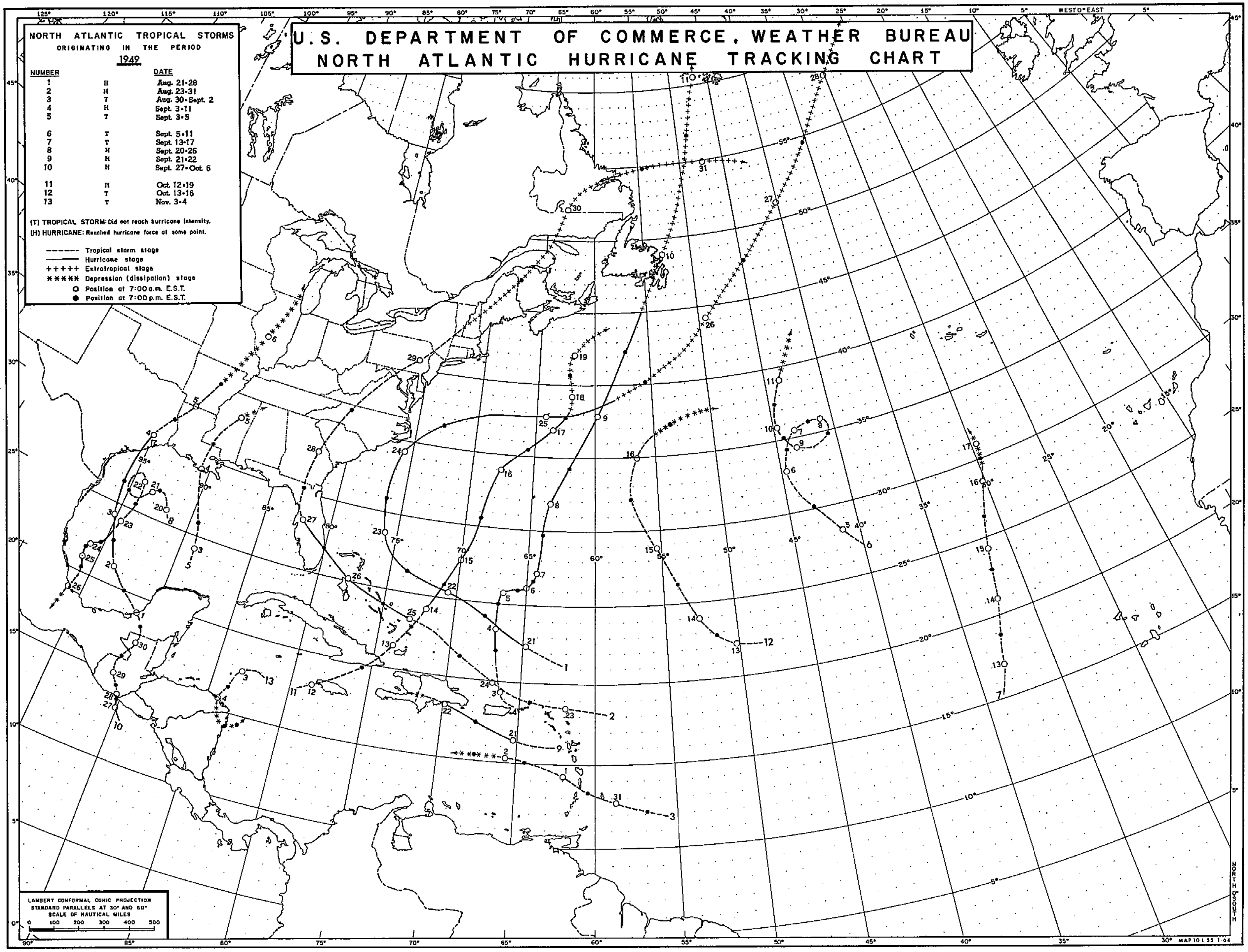

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1946
NUMBER
DATE
1 T June 13-16
2 H July 5-10
3 T Aug. 24-25
4 H Sept. 12-17
5 H Oct. 5-14
6 T Oct. 31- Nov. 3
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0 EAST
NORTH 0 SOUTH
MAP 10 L 55 1-64

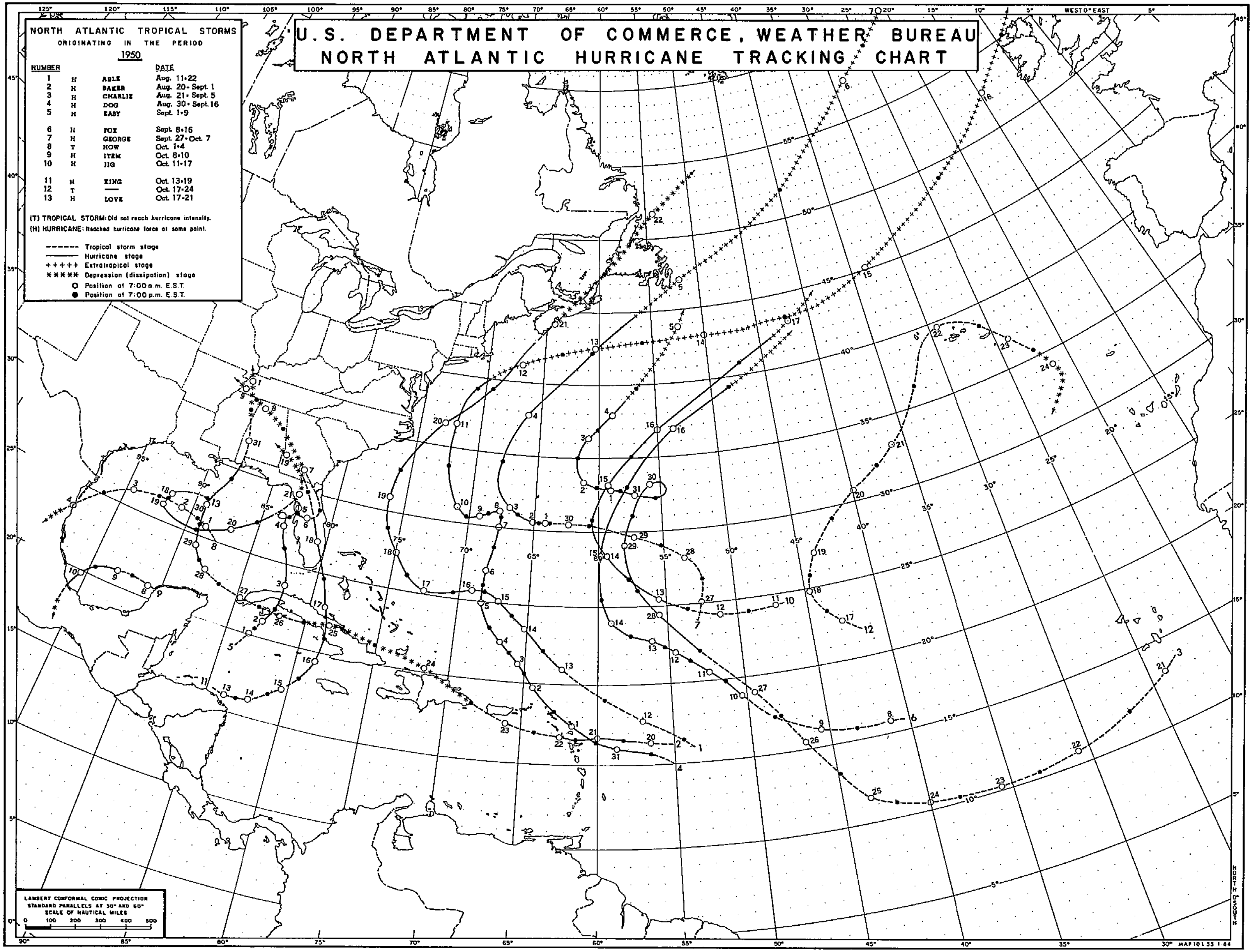


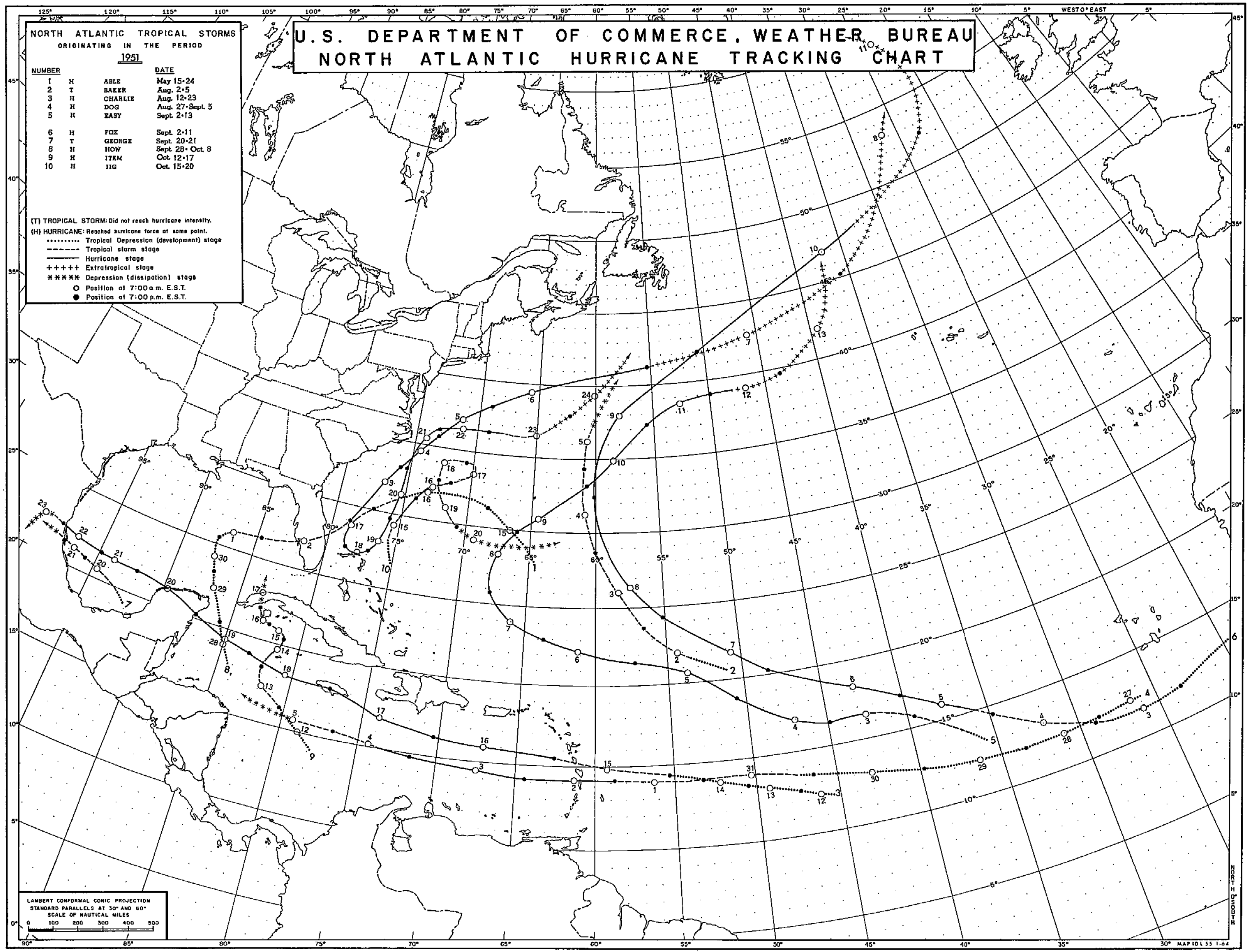
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1947
NUMBER DATE
1 T July 31 - Aug. 2
2 H Aug. 9-15
3 H Aug. 18-27
4 H Sept. 4-21
5 T Sept. 7-8
6 T Sept. 20-25
7 T Oct. 6-8
8 H Oct. 9-16
9 H Oct. 16-21
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 33 1 64

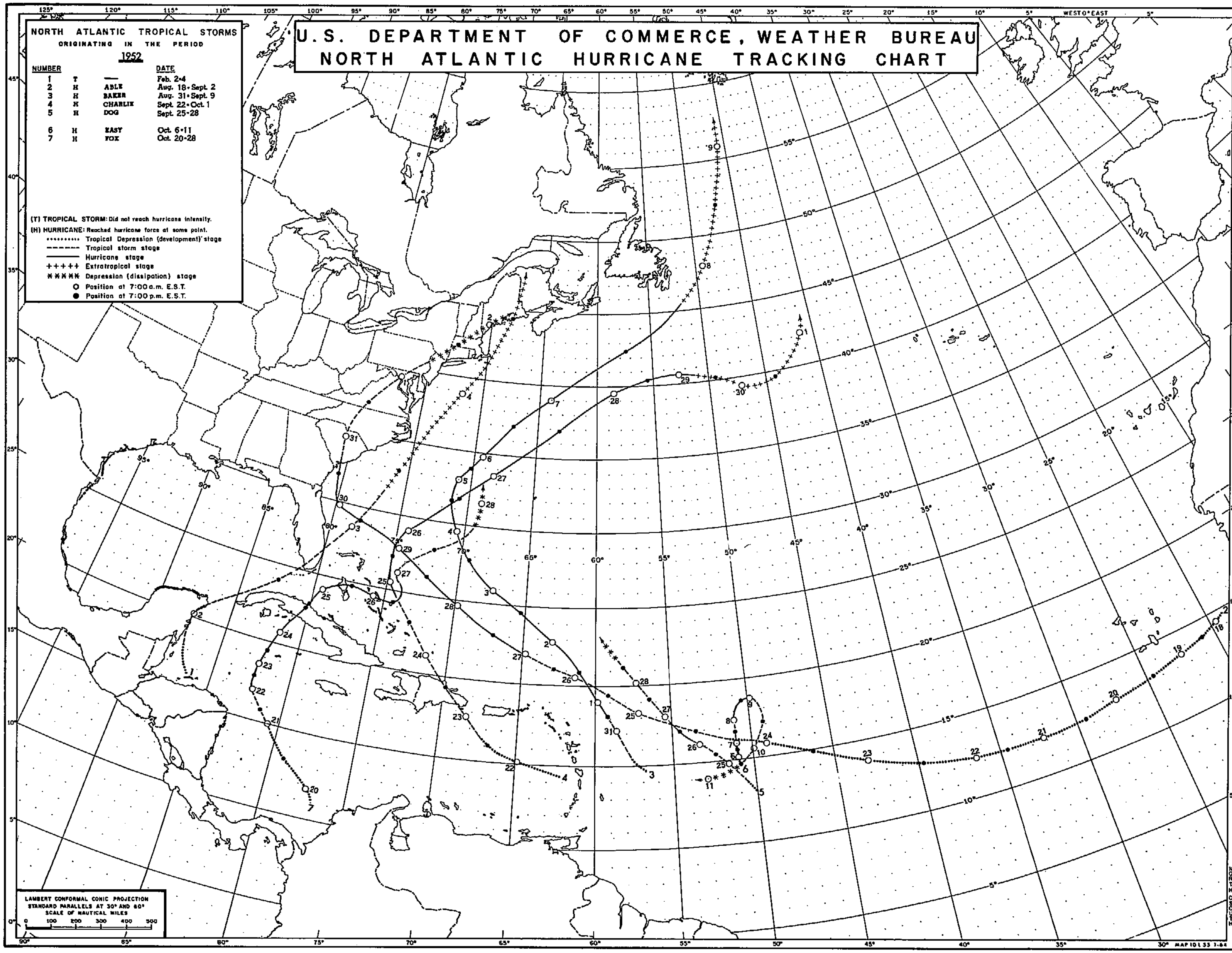


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1948
NUMBER
DATE
1 T May 22-28
2 T July 7-11
3 H Aug. 26-Sept. 4
4 T Aug. 30-Sept. 1
5 H Sept. 1-6
6 H Sept. 4-16
7 H Sept. 18-25
8 H Oct. 3-15
9 H Nov. 8-10
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

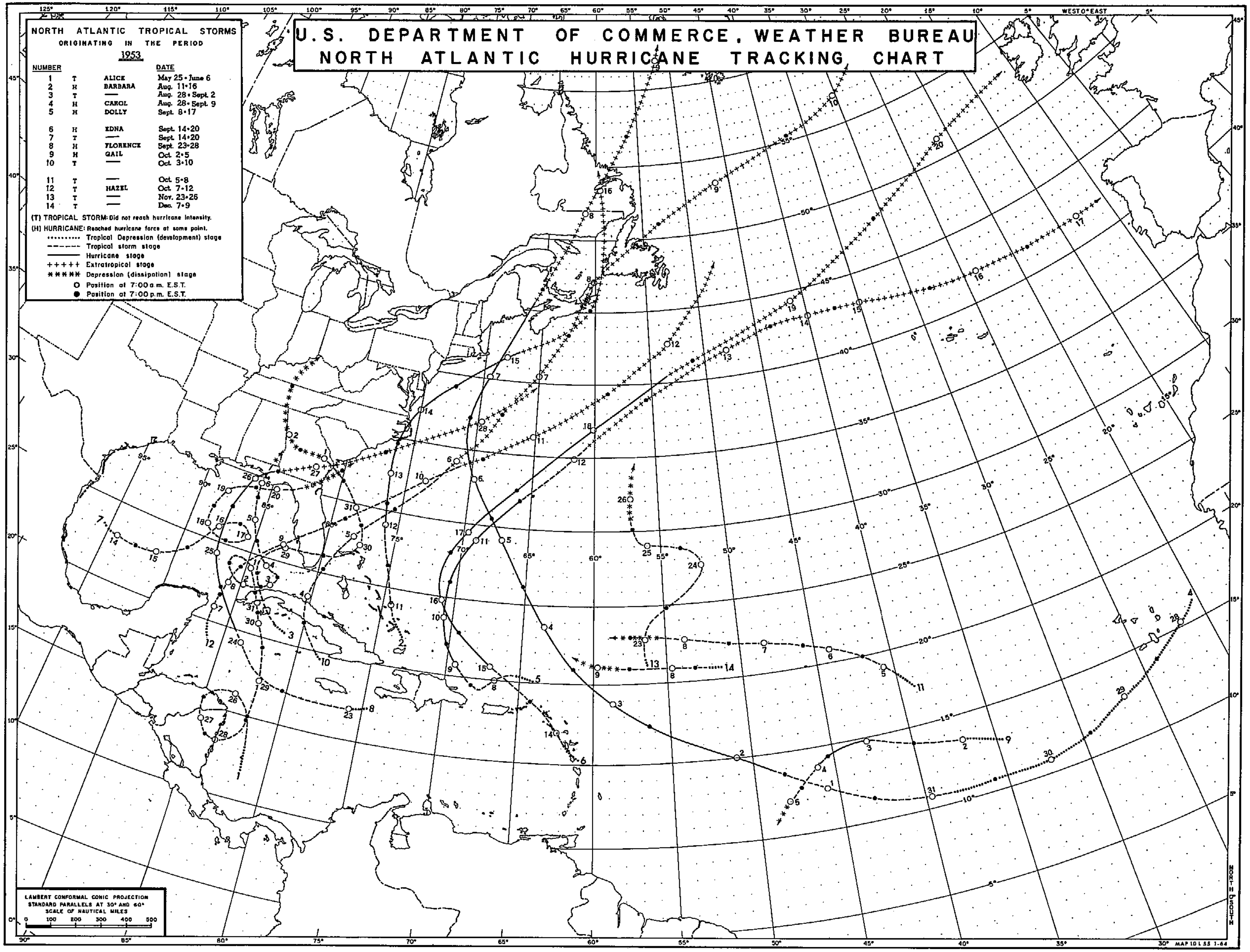

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1949
NUMBER DATE
1 H Aug. 21-28
2 H Aug. 23-31
3 T Aug. 30-Sept. 2
4 H Sept. 3-11
5 T Sept. 3-5
6 T Sept. 5-11
7 T Sept. 13-17
8 H Sept. 20-26
9 H Sept. 21-22
10 H Sept. 27-Oct. 6
11 H Oct. 12-19
12 T Oct. 13-16
13 T Nov. 3-4
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
O Position at 7:00 a.m. E.S.T.
● Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 55 1-64

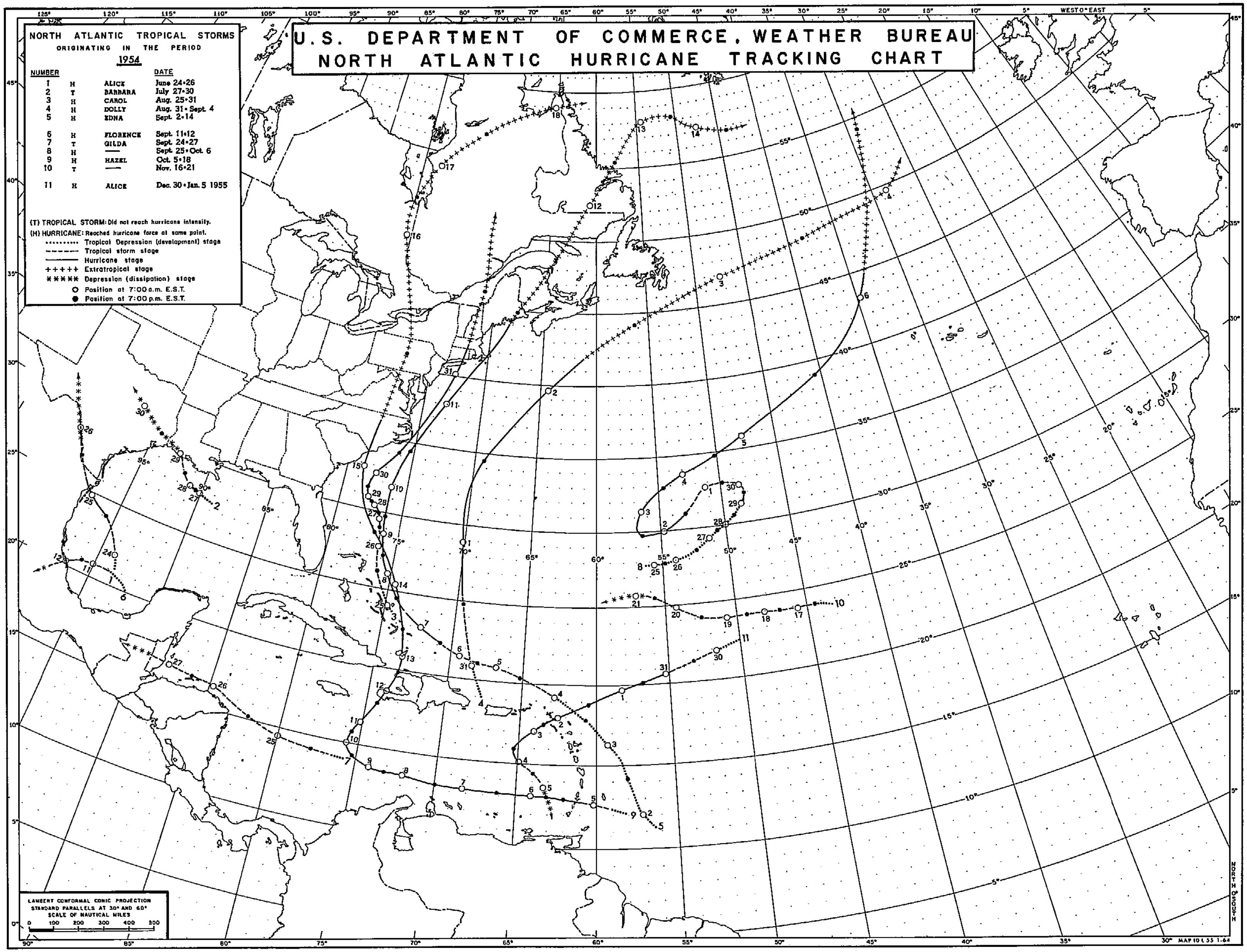

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1950
NUMBER DATE
1 H ABLE Aug. 11-22
2 H BAKER Aug. 20-Sept. 1
3 H CHARLIE Aug. 21-Sept. 5
4 H DOG Aug. 30-Sept. 16
5 H EASY Sept. 1-9
6 H FOX Sept. 8-16
7 H GEORGE Sept. 27-Oct. 7
8 T HOW Oct. 1-4
9 H ITEM Oct. 8-10
10 H JIG Oct. 11-17
11 H KING Oct. 13-19
12 T — Oct. 17-24
13 H LOVE Oct. 17-21
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
------ Tropical storm stage
Hurricane stage
+++++ Extratropical stage
***** Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
MAP 10 L 33 1 64

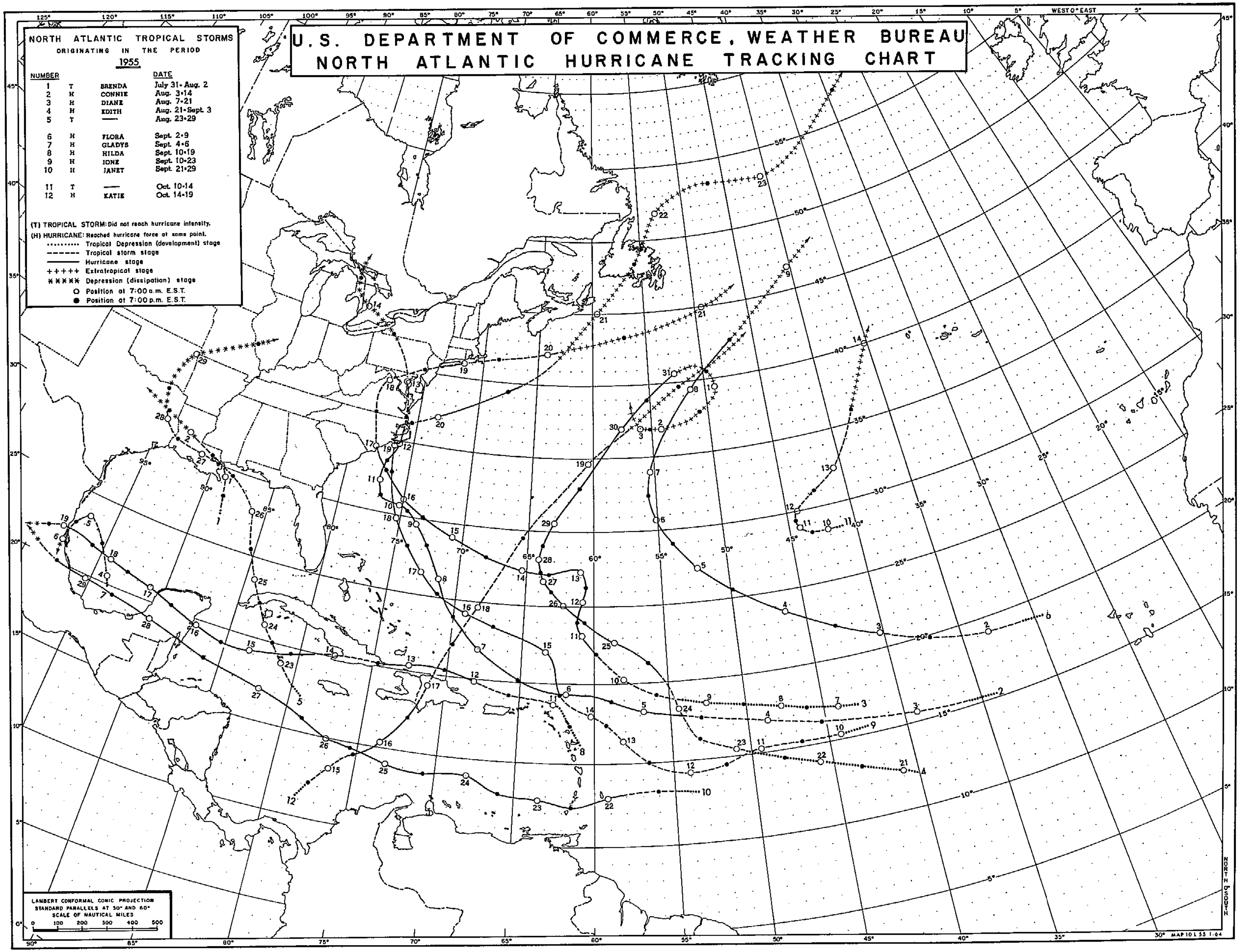

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1951
NUMBER DATE
1 H ABLE May 15-24
2 T BAKER Aug. 2-5
3 H CHARLIE Aug. 12-23
4 H DOG Aug. 27-Sept. 5
5 H EASY Sept. 2-13
6 H FOX Sept. 2-11
7 T GEORGE Sept. 20-21
8 H HOW Sept. 28- Oct. 8
9 H ITEM Oct. 12-17
10 H JIG Oct. 15-20
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST O EAST
MAP 10 L 55 1-64

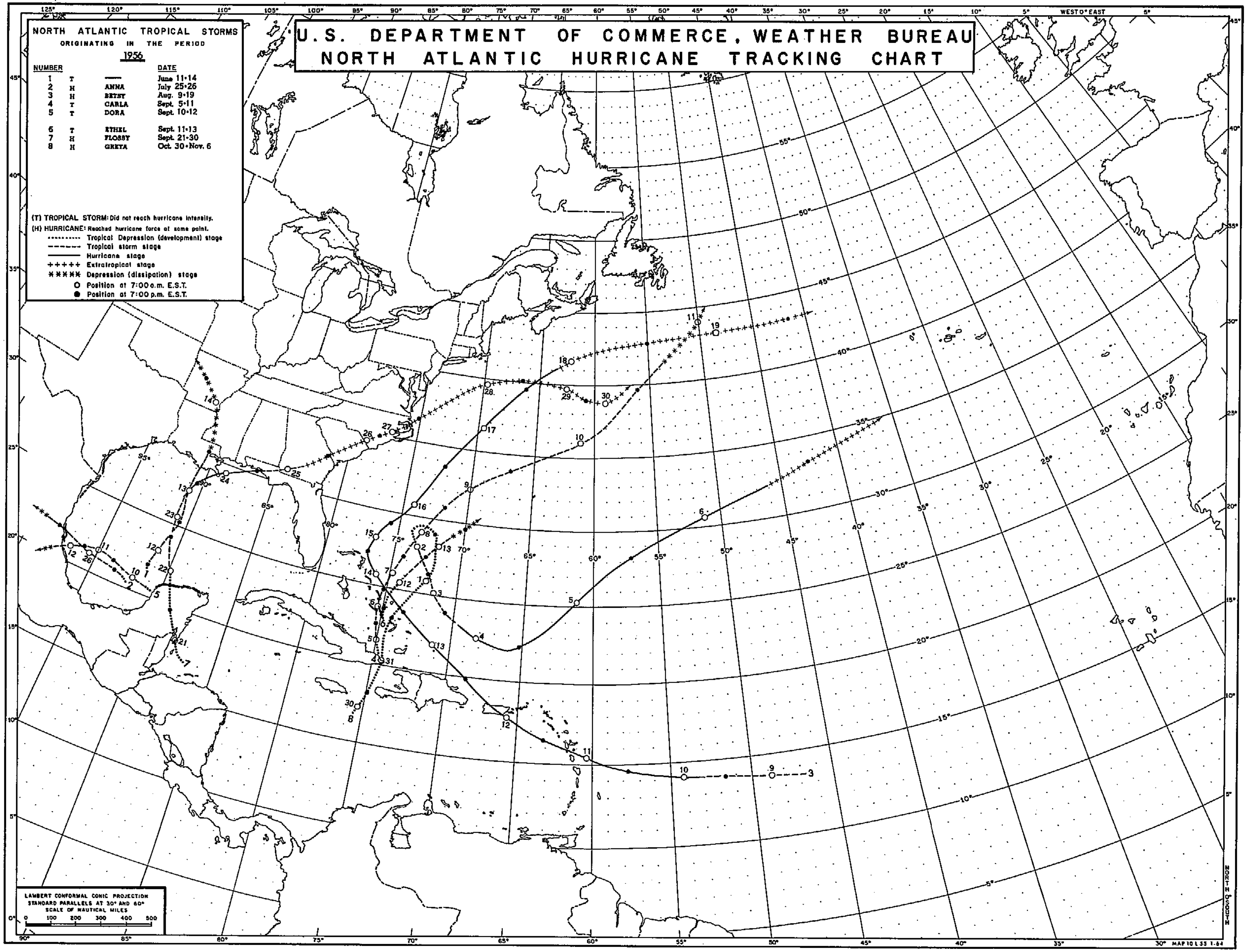


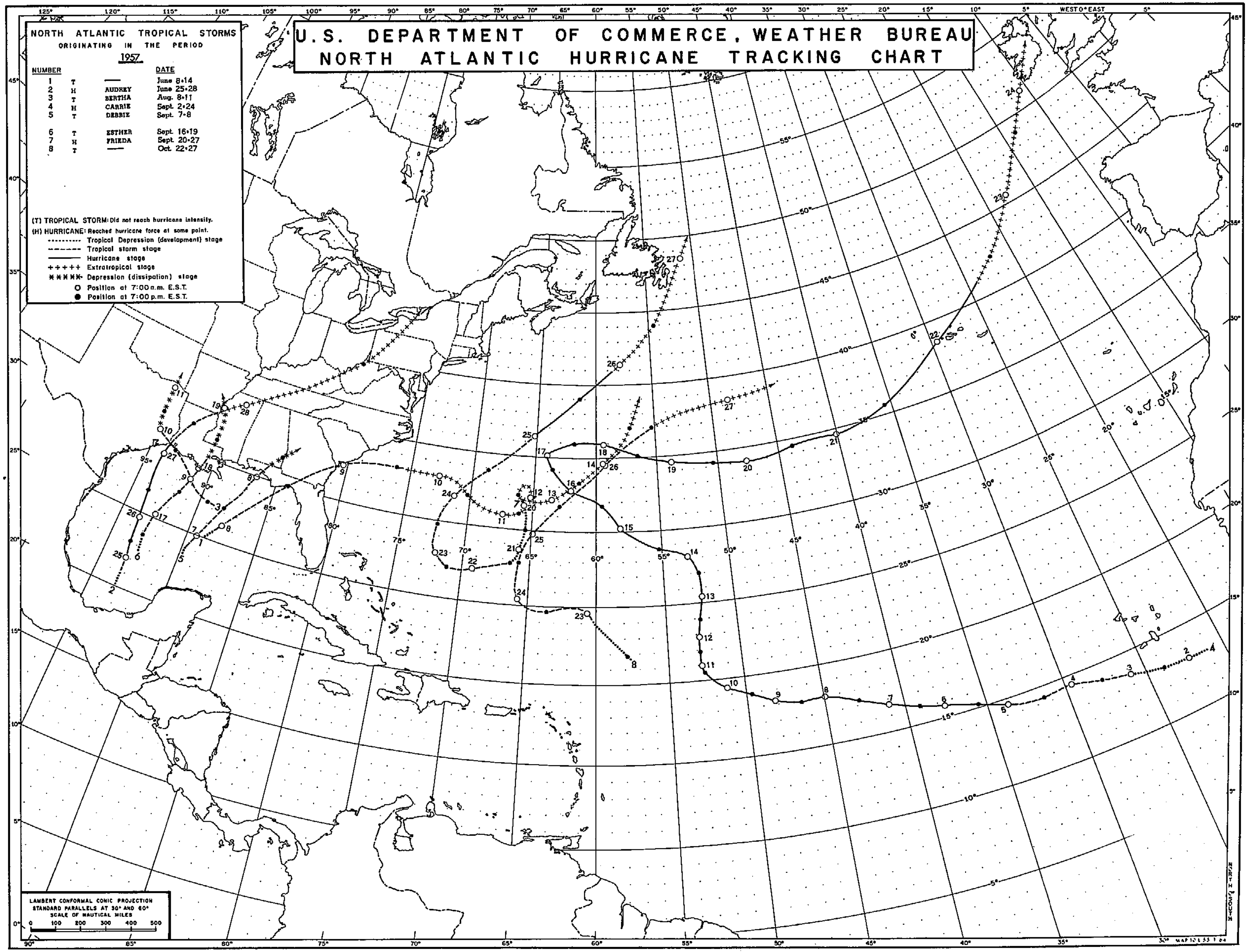
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1952
NUMBER DATE
1 T — Feb. 2-4
2 H ABLE Aug. 18-Sept. 2
3 H BAKER Aug. 31-Sept. 9
4 H CHARLIE Sept. 22-Oct. 1
5 H DOG Sept. 25-28
6 H EASY Oct. 6-11
7 H FOX Oct. 20-28
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

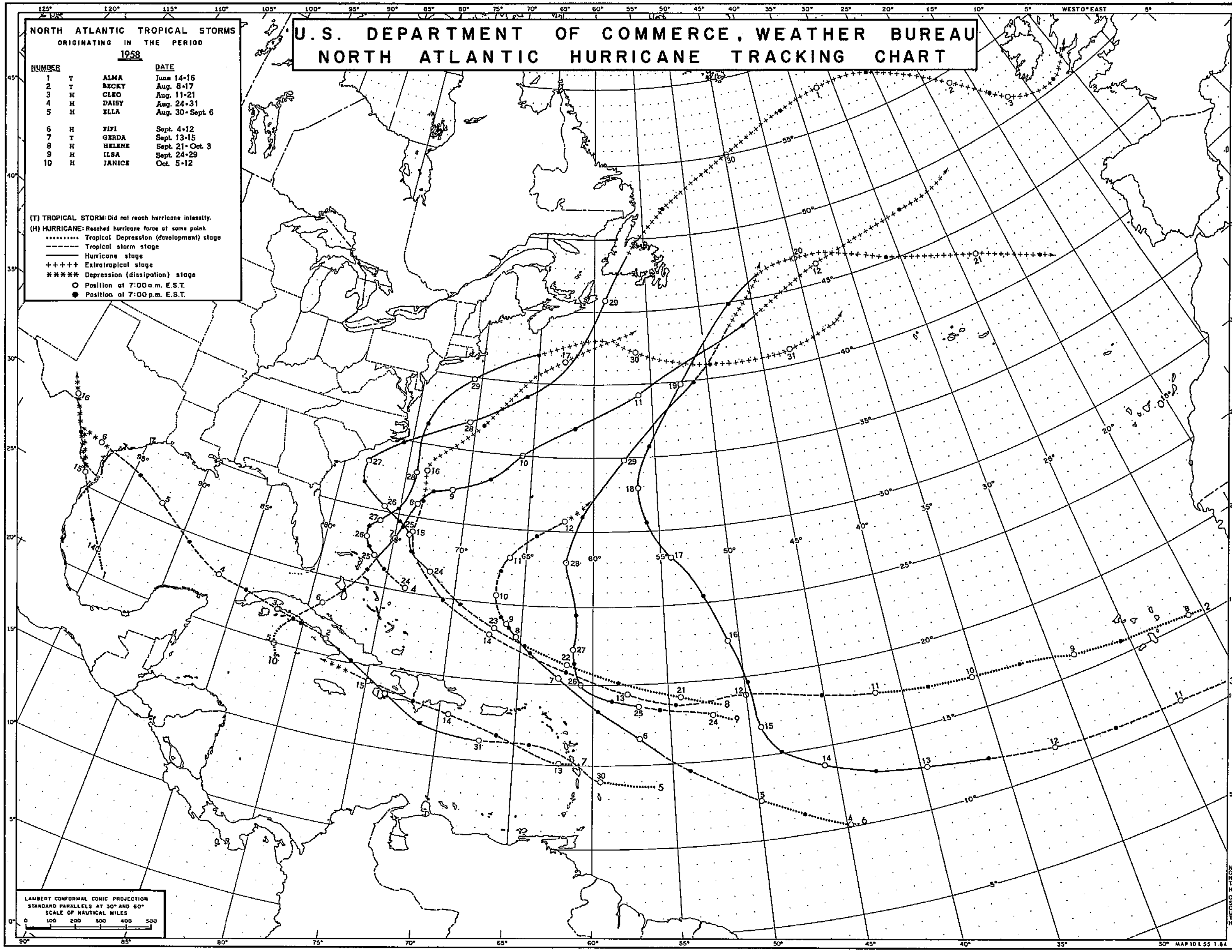

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1953
NUMBER
DATE
1 T ALICE May 25 - June 6
2 H BARBARA Aug. 11-16
3 T — Aug. 28 - Sept. 2
4 H CAROL Aug. 28 - Sept. 9
5 H DOLLY Sept. 8-17
6 H EDNA Sept. 14-20
7 T — Sept. 14-20
8 H FLORENCE Sept. 23-28
9 H GAIL Oct. 2-5
10 T — Oct. 3-10
11 T — Oct. 5-8
12 T HAZEL Oct. 7-12
13 T — Nov. 23-26
14 T — Dec. 7-9
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH 0° SOUTH
MAP 10 L 55 1-64

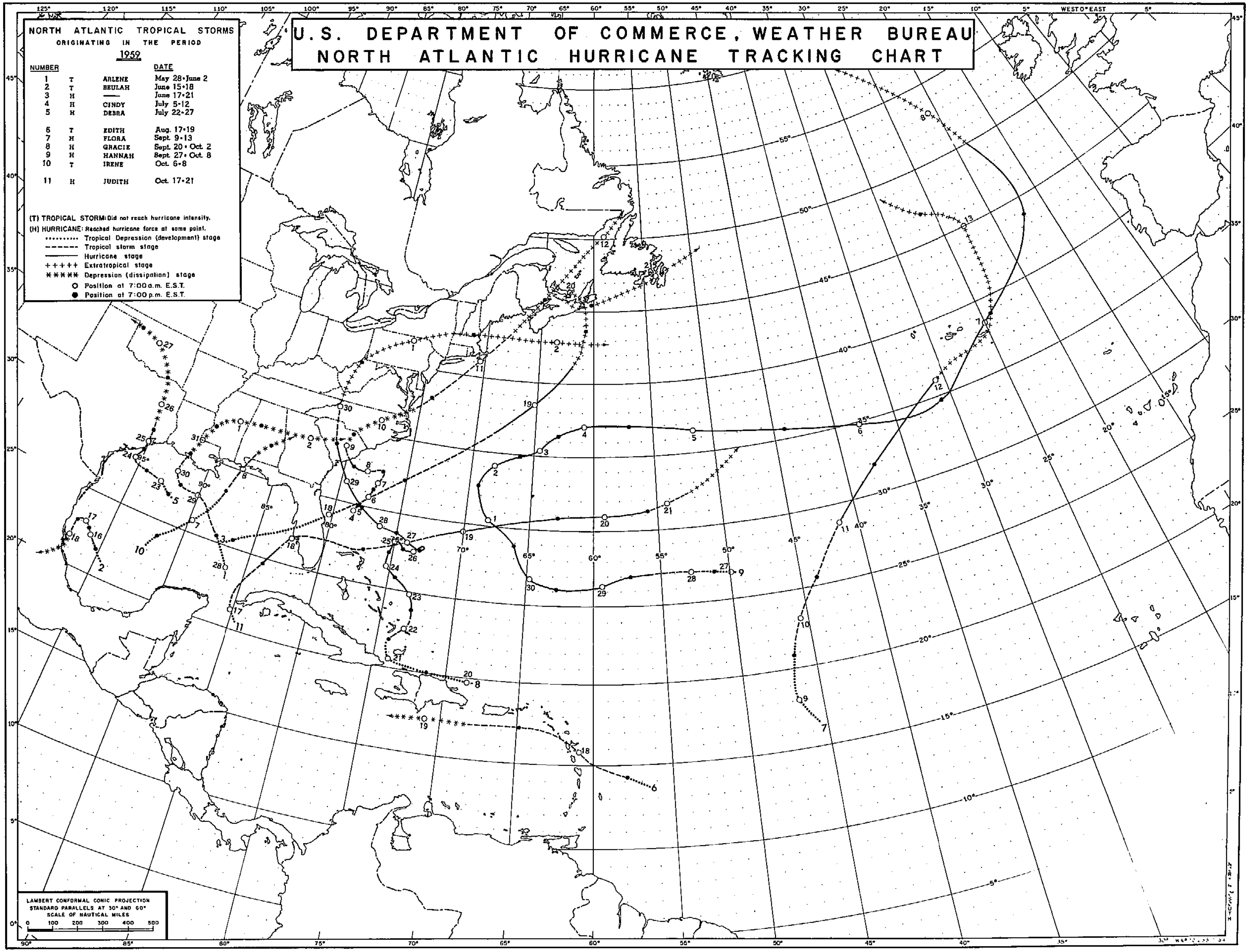

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1954
NUMBER DATE
1 H ALICE June 24-26
2 T BARBARA July 27-30
3 H CAROL Aug. 25-31
4 H DOLLY Aug. 31-Sept. 4
5 H EDNA Sept. 2-14
6 H FLORENCE Sept. 11-12
7 T GILDA Sept. 24-27
8 H — Sept. 25-Oct. 6
9 H HAZEL Oct. 5-18
10 T — Nov. 16-21
11 H ALICE Dec. 30-Jan. 5 1955
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST ◦ EAST
NORTH ◦ SOUTH

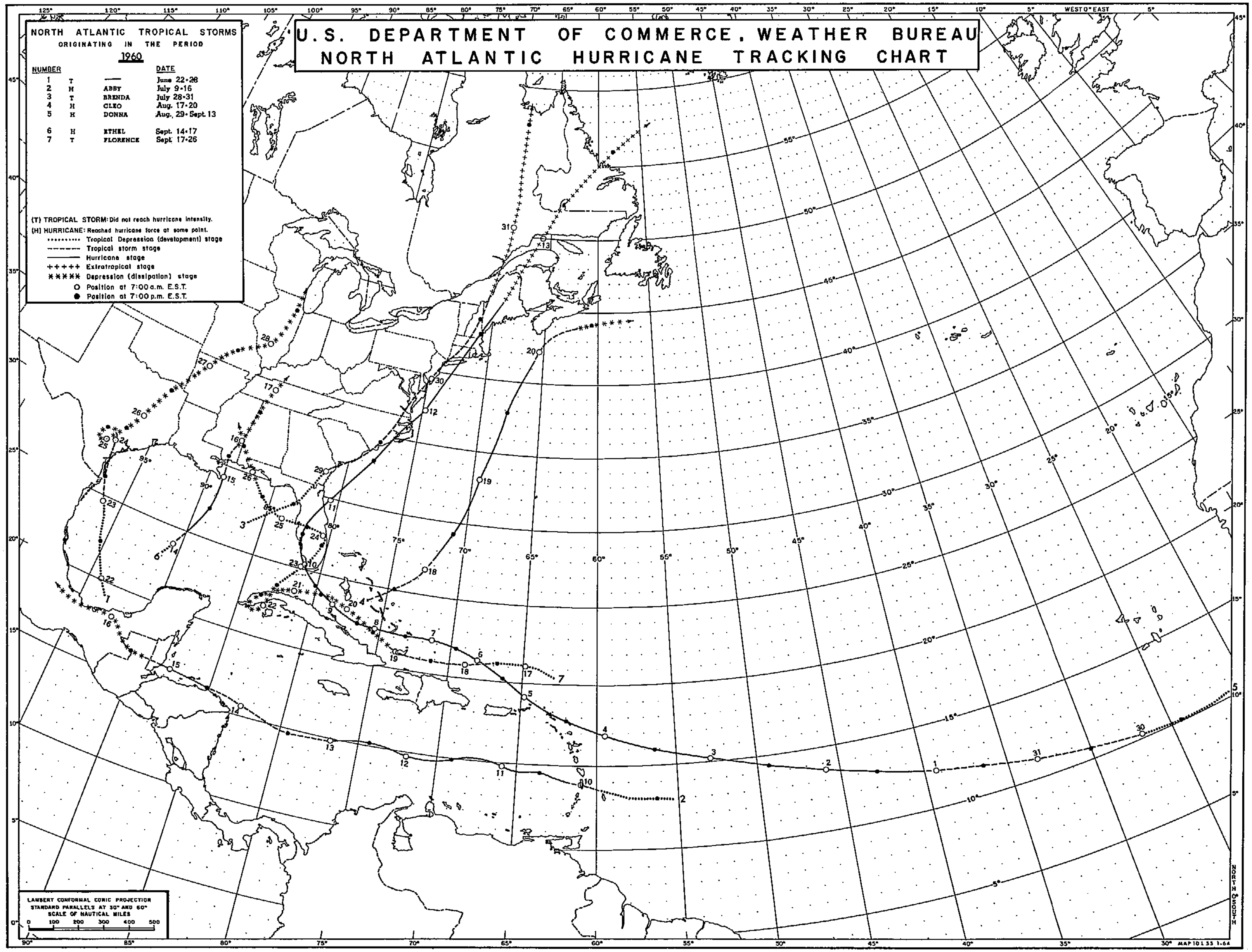

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1955
NUMBER
DATE
1 T BRENDA July 31 - Aug. 2
2 H CONNIE Aug. 3-14
3 H DIANE Aug. 7-21
4 H EDITH Aug. 21-Sept. 3
5 T —— Aug. 23-29
6 H FLORA Sept. 2-9
7 H GLADYS Sept. 4-6
8 H HILDA Sept. 10-19
9 H IONE Sept. 10-23
10 H JANET Sept. 21-29
11 T —— Oct. 10-14
12 H KATIE Oct. 14-19
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH SOUTH

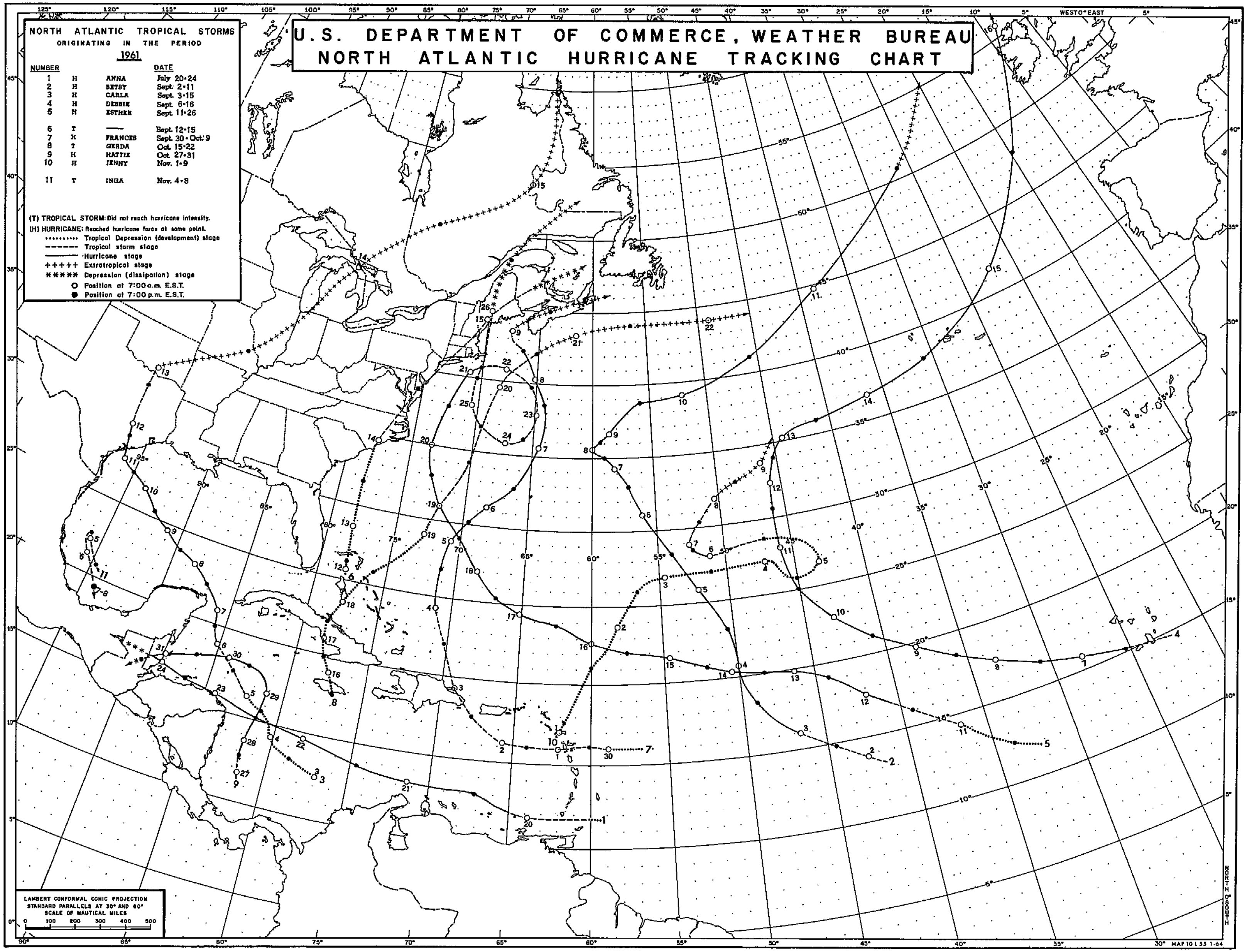

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS ORIGINATING IN THE PERIOD 1956
NUMBER DATE
1 T June 11-14
2 H ANNA July 25-26
3 H BETSY Aug. 9-19
4 T CARLA Sept. 5-11
5 T DORA Sept. 10-12
6 T ETHEL Sept. 11-13
7 H FLOSSY Sept. 21-30
8 H GRETA Oct. 30-Nov. 6
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

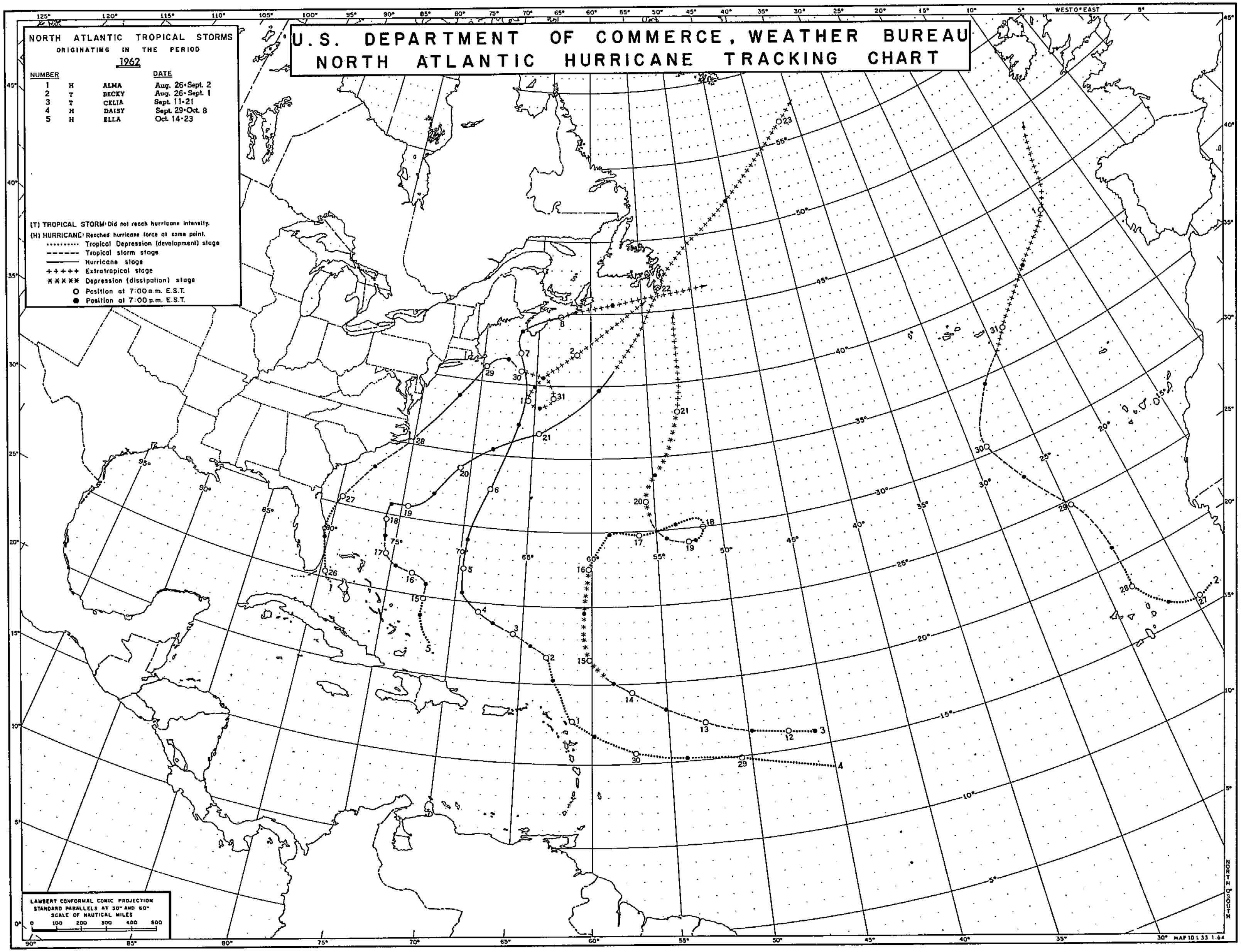

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1957
NUMBER DATE
1 T — June 8-14
2 H AUDREY June 25-28
3 T BERTHA Aug. 8-11
4 H CARRIE Sept. 2-24
5 T DEBBIE Sept. 7-8
6 T ESTHER Sept. 16-19
7 H FRIEDA Sept. 20-27
8 T — Oct. 22-27
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST

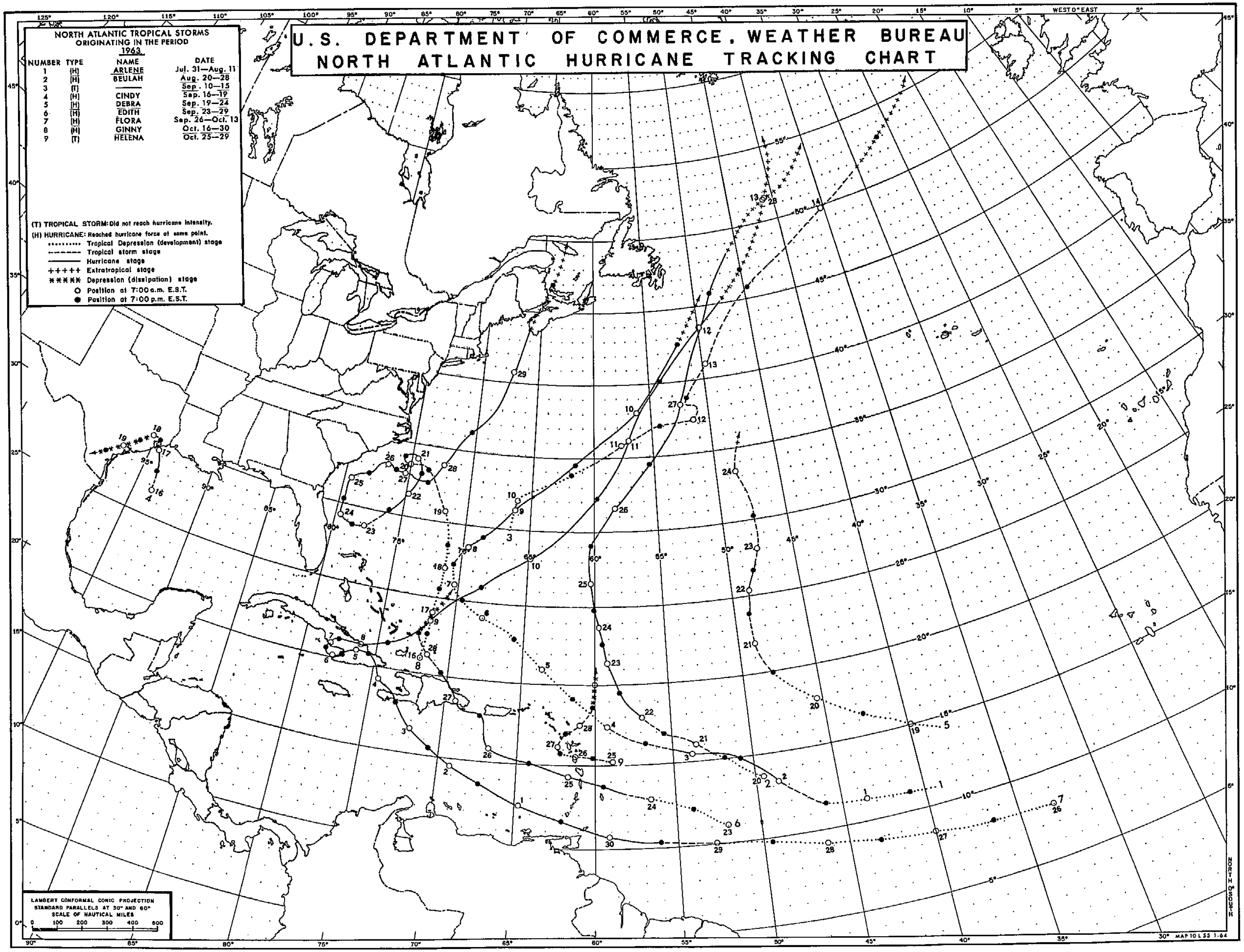

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1958
NUMBER
DATE
1 T ALMA June 14-16
2 T BECKY Aug. 8-17
3 H CLEO Aug. 11-21
4 H DAISY Aug. 24-31
5 H ELLA Aug. 30-Sept. 6
6 H FIFI Sept. 4-12
7 T GERDA Sept. 13-15
8 H HELENE Sept. 21-Oct. 3
9 H ILSA Sept. 24-29
10 H JANICE Oct. 5-12
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1959
NUMBER
DATE
1 T ARLENE May 28-June 2
2 T BEULAH June 15-18
3 H —— June 17-21
4 H CINDY July 5-12
5 H DEBRA July 22-27
6 T EDITH Aug. 17-19
7 H FLORA Sept. 9-13
8 H GRACIE Sept. 20-Oct. 2
9 H HANNAH Sept. 27-Oct. 8
10 T IRENE Oct. 6-8
11 H JUDITH Oct. 17-21
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

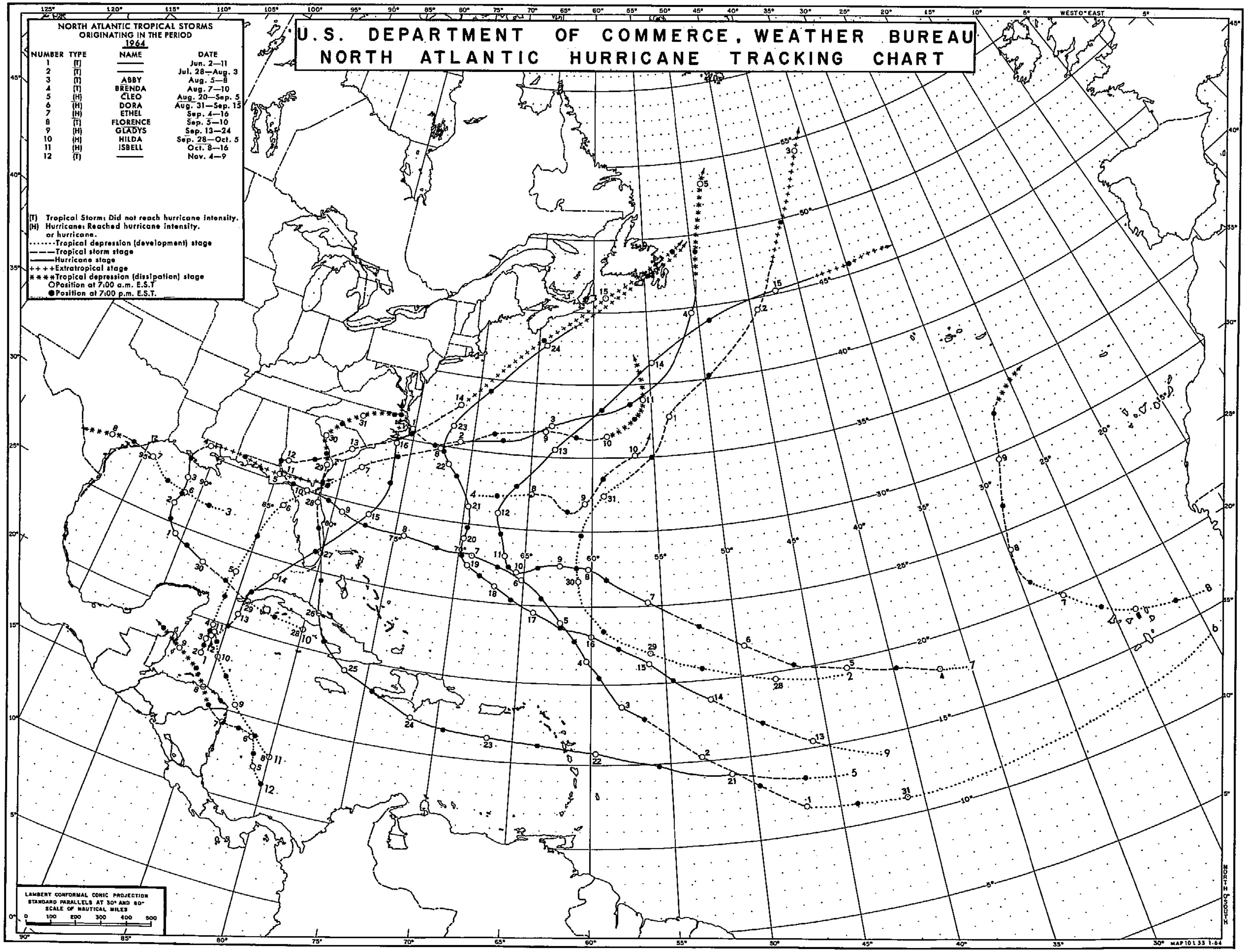

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1960
NUMBER DATE
1 T — June 22-28
2 H ABBY July 9-16
3 T BRENDA July 28-31
4 H CLEO Aug. 17-20
5 H DONNA Aug. 29-Sept. 13
6 H ETHEL Sept. 14-17
7 T FLORENCE Sept. 17-26
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH SOUTH
MAP 101 35 1-64


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1961
NUMBER
DATE
1 H ANNA July 20-24
2 H BETSY Sept. 2-11
3 H CARLA Sept. 3-15
4 H DEBBIE Sept. 6-16
5 H ESTHER Sept. 11-26
6 T —— Sept. 12-15
7 H FRANCES Sept. 30-Oct. 9
8 T GERDA Oct. 15-22
9 H HATTIE Oct. 27-31
10 H JENNY Nov. 1-9
11 T INGA Nov. 4-8
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH 0° SOUTH
MAP 10 L 35 1-64

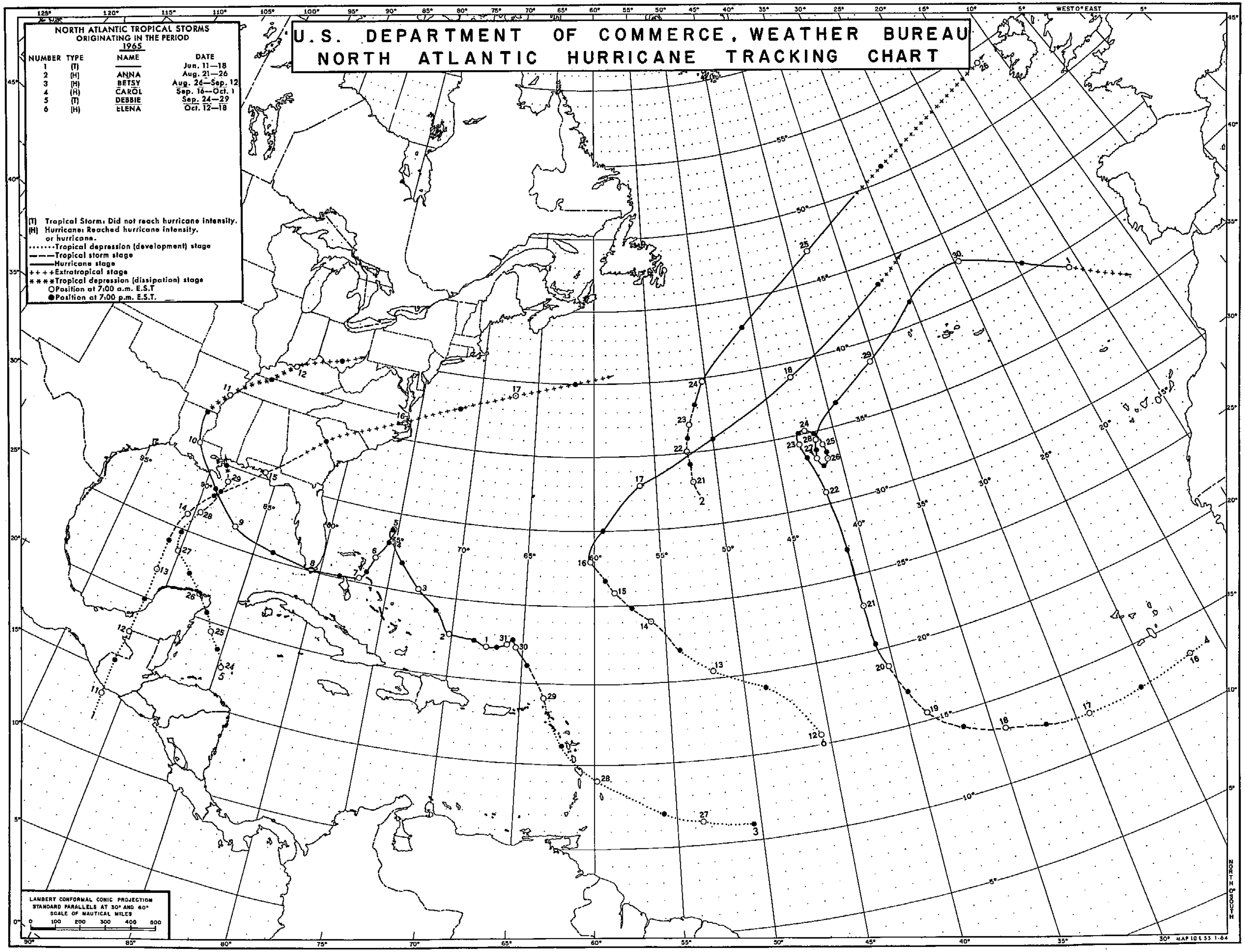

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1962
NUMBER DATE
1 H ALMA Aug. 26-Sept. 2
2 T BECKY Aug. 26-Sept. 1
3 T CELIA Sept. 11-21
4 H DAISY Sept. 29-Oct. 8
5 H ELLA Oct. 14-23
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST O EAST

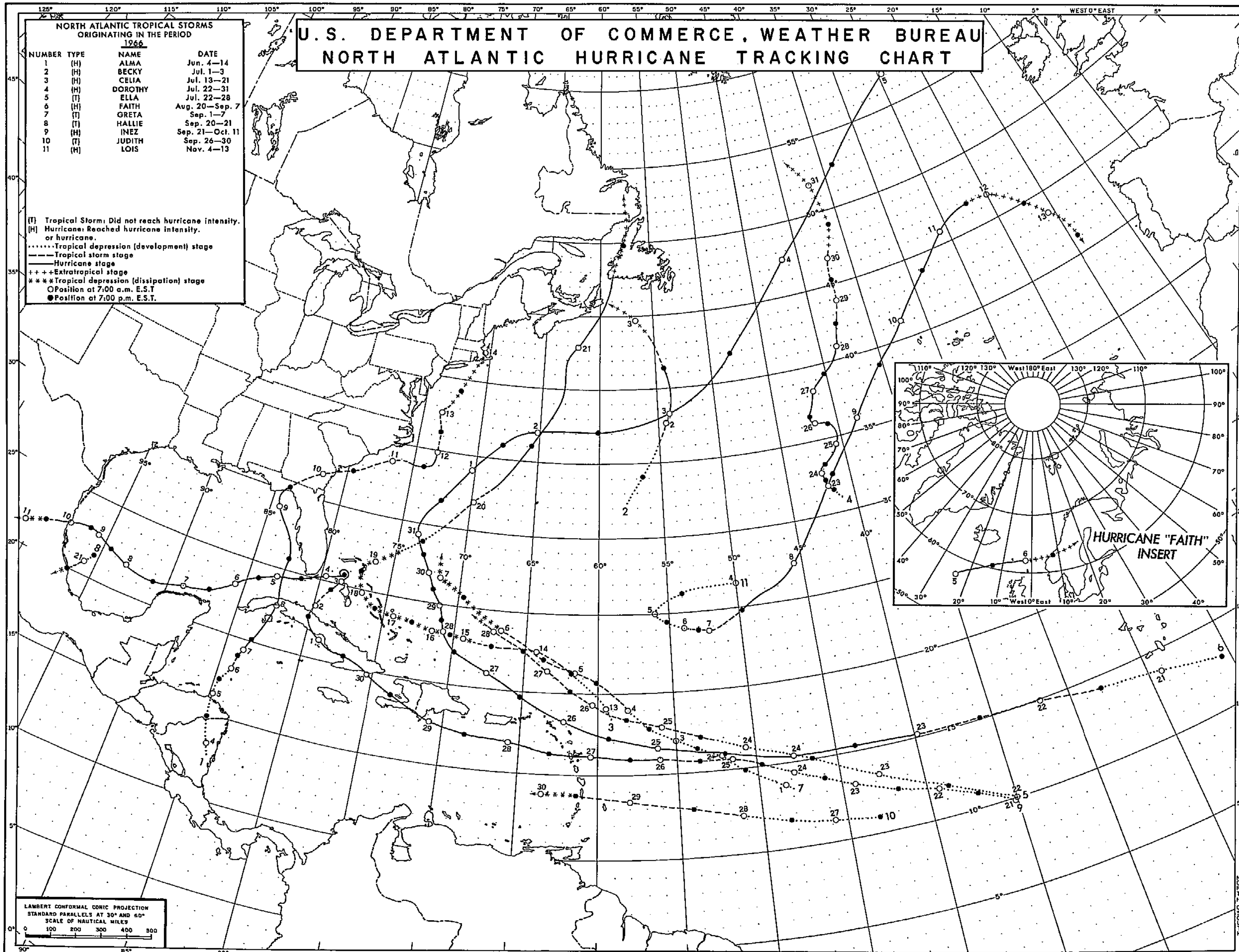


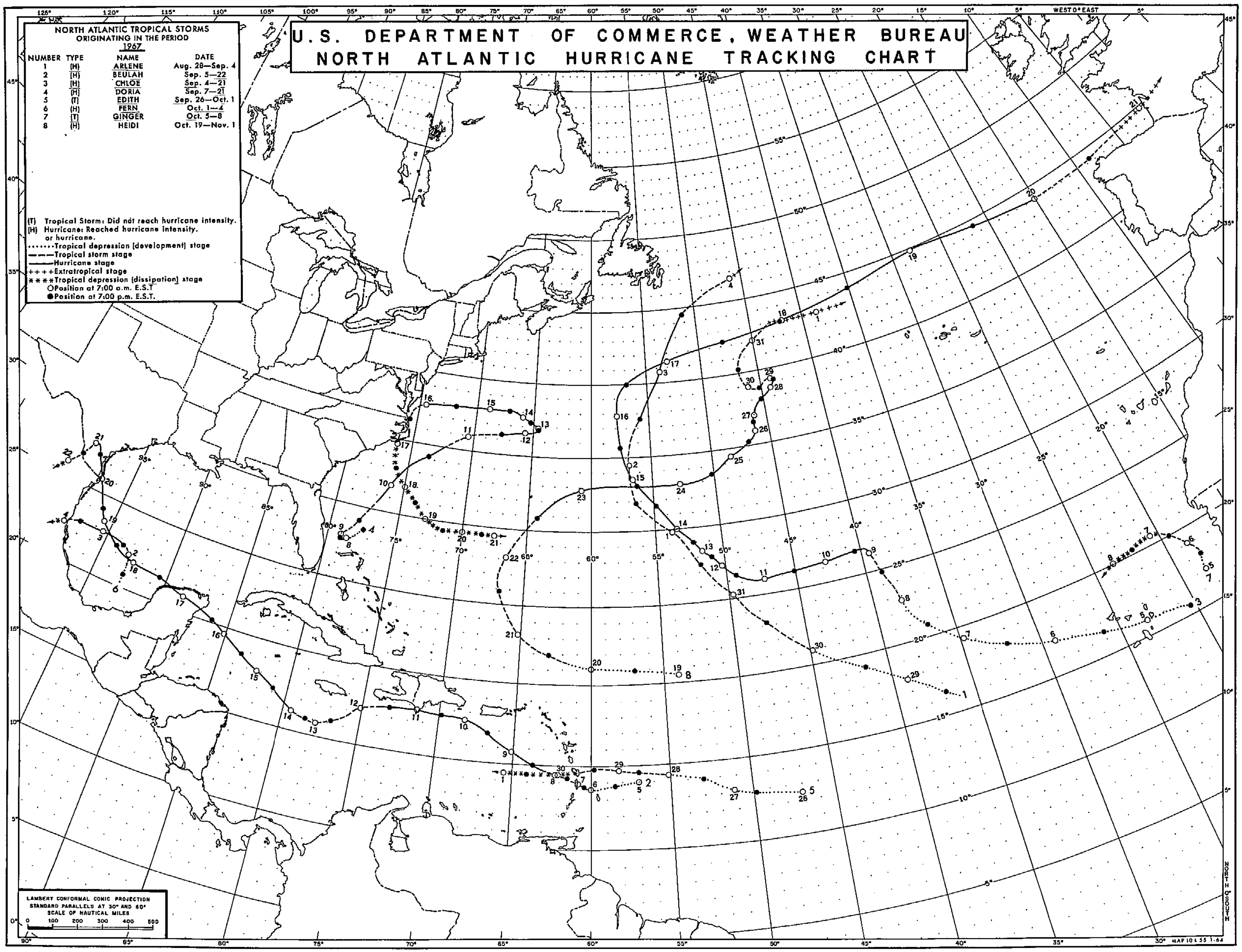
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1963
NUMBER TYPE NAME DATE
1 (H) ARLENE Jul. 31—Aug. 11
2 (H) BEULAH Aug. 20—28
3 (T) ——— Sep. 10—15
4 (H) CINDY Sep. 16—19
5 (H) DEBRA Sep. 19—24
6 (H) EDITH Sep. 23—29
7 (H) FLORA Sep. 26—Oct. 13
8 (H) GINNY Oct. 16—30
9 (T) HELENA Oct. 25—29
(T) TROPICAL STORM: Did not reach hurricane intensity.
(H) HURRICANE: Reached hurricane force at some point.
Tropical Depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Depression (dissipation) stage
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
WEST 0° EAST
NORTH POLE
MAP 10 L 5 5 1-64

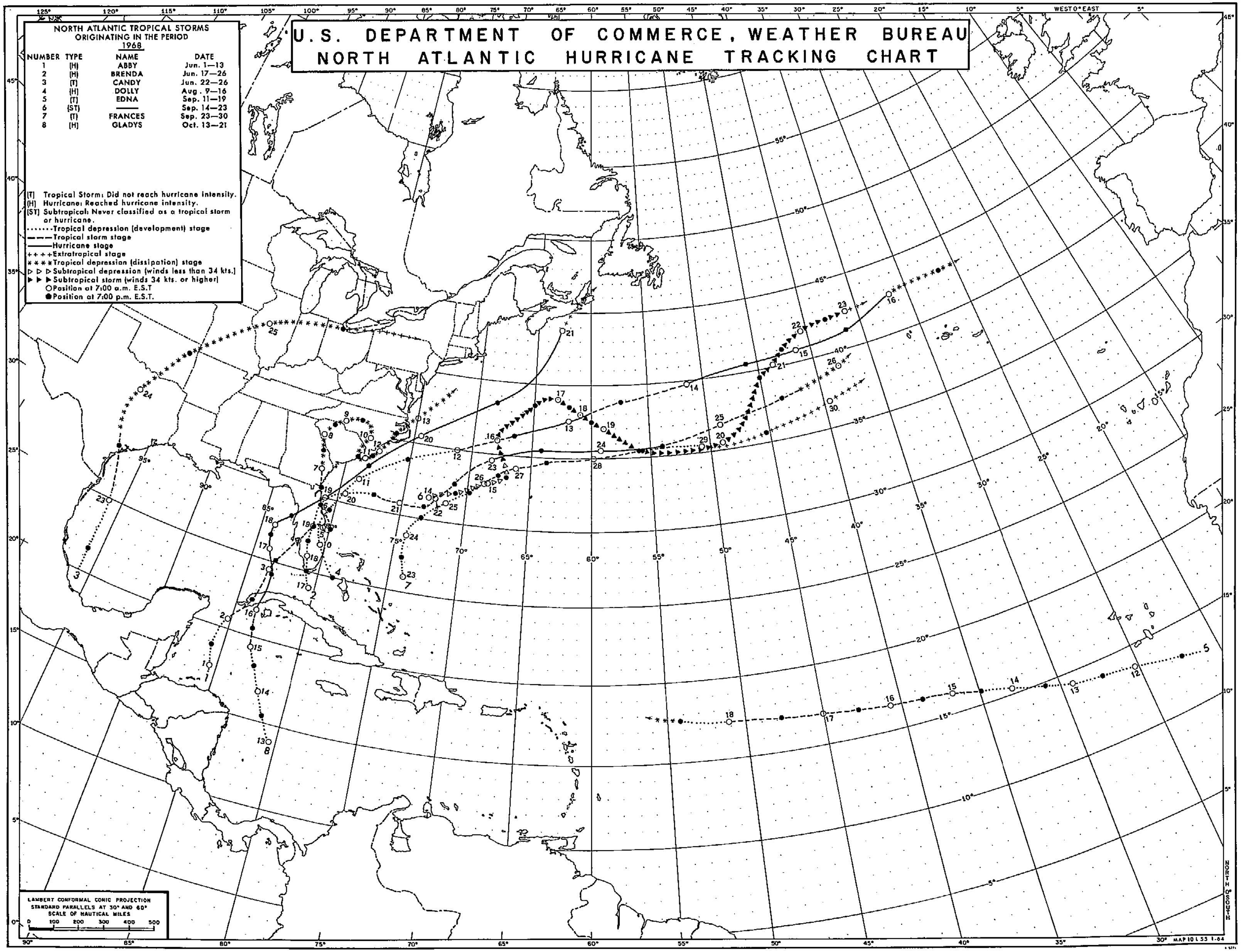


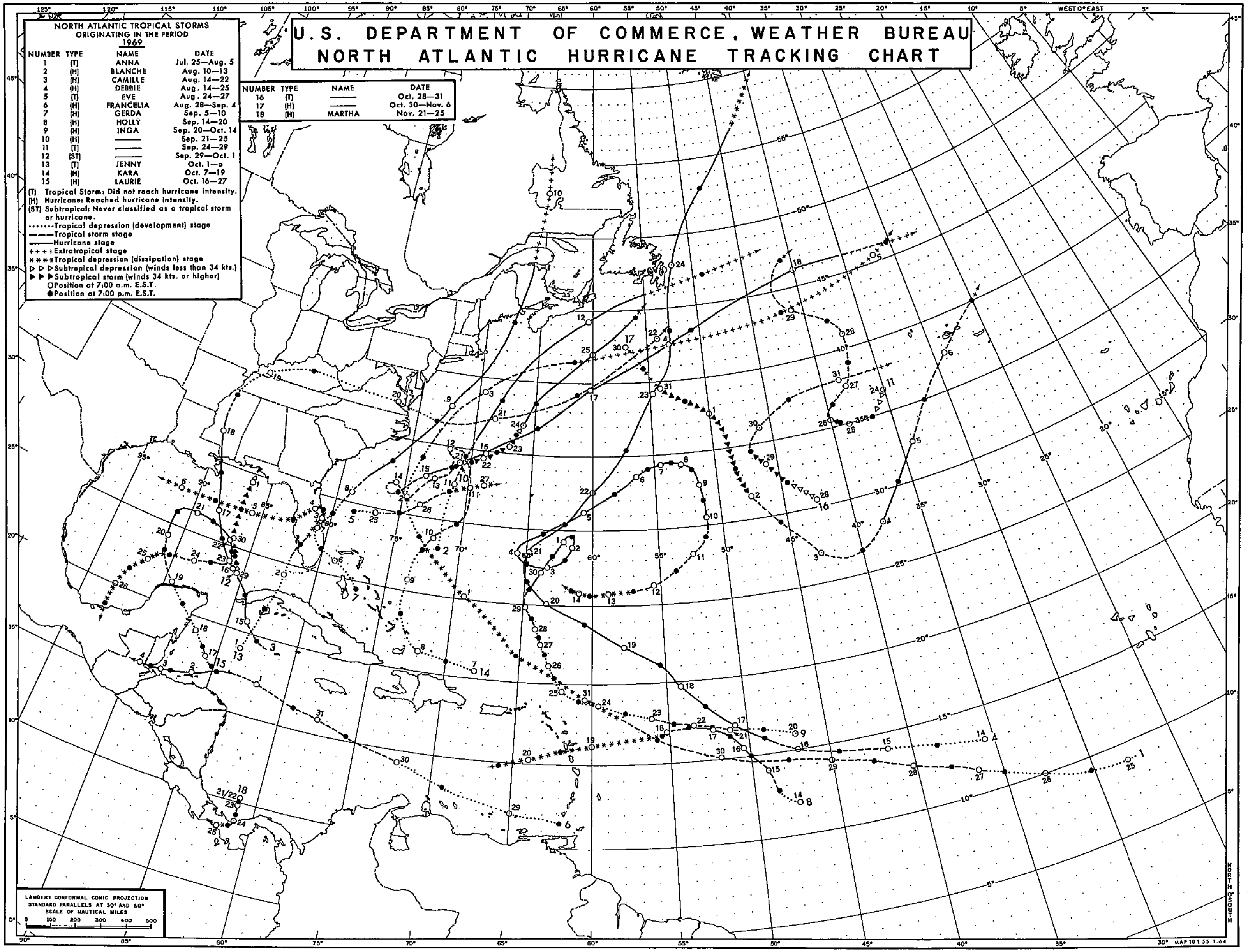
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1964
NUMBER TYPE NAME DATE
1 (T) —— Jun. 2—11
2 (T) —— Jul. 28—Aug. 3
3 (T) ABBY Aug. 5—8
4 (T) BRENDA Aug. 7—10
5 (H) CLEO Aug. 20—Sep. 5
6 (H) DORA Aug. 31—Sep. 15
7 (H) ETHEL Sep. 4—16
8 (T) FLORENCE Sep. 5—10
9 (H) GLADYS Sep. 13—24
10 (H) HILDA Sep. 28—Oct. 5
11 (H) ISBELL Oct. 8—16
12 (T) —— Nov. 4—9
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
or hurricane.
·······Tropical depression (development) stage
———Tropical storm stage
———Hurricane stage
++++Extratropical stage
****Tropical depression (dissipation) stage
○Position at 7:00 a.m. E.S.T
●Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH SOUTH
MAP 101 L 33 1-64

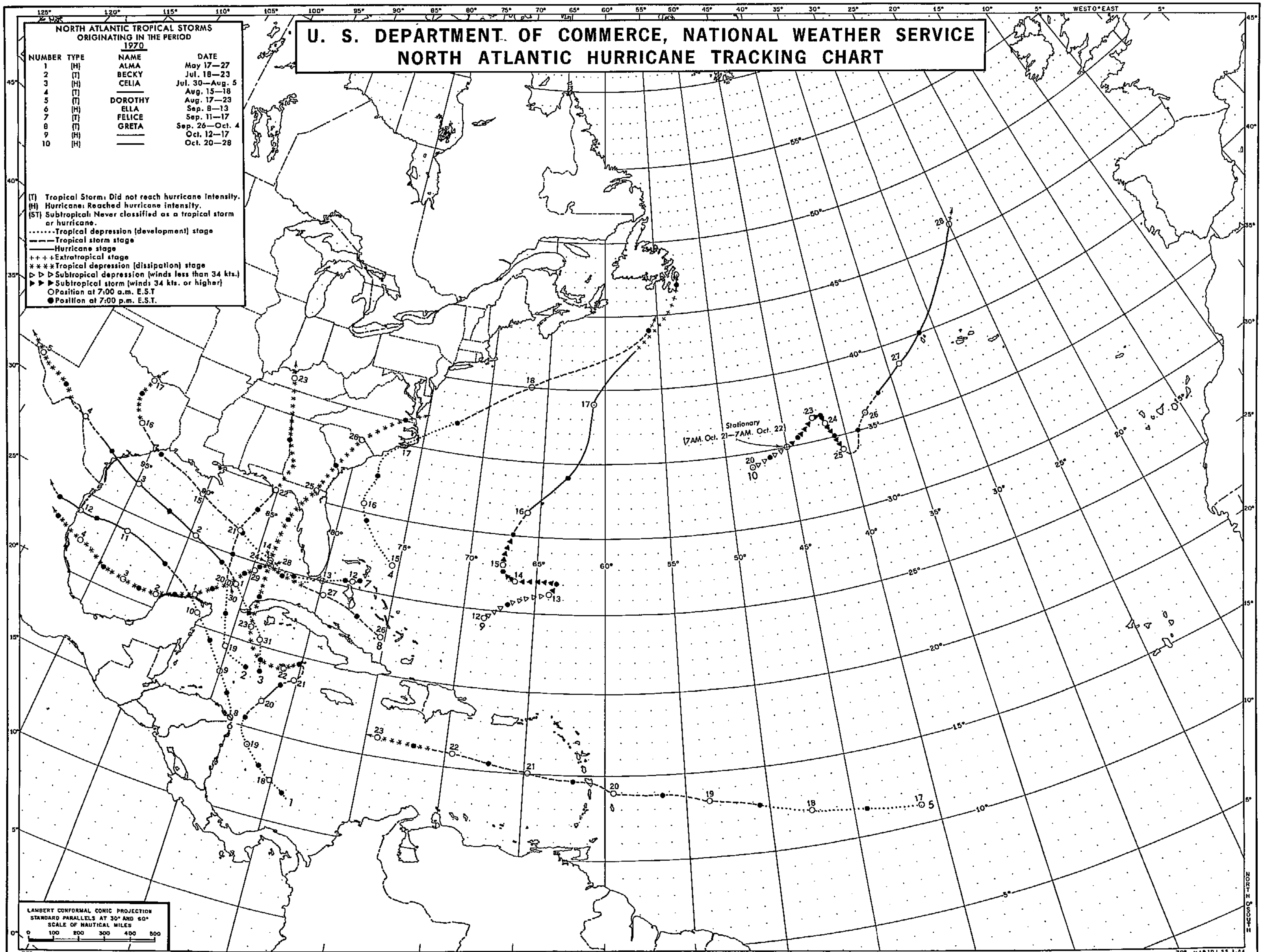

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1965
NUMBER TYPE NAME DATE
1 (T) —— Jun. 11—18
2 (H) ANNA Aug. 21—26
3 (H) BETSY Aug. 26—Sep. 12
4 (H) CAROL Sep. 16—Oct. 1
5 (T) DEBBIE Sep. 24—29
6 (H) ELENA Oct. 12—18
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity, or hurricane.
·······Tropical depression (development) stage
— — —Tropical storm stage
———Hurricane stage
+ + + +Extratropical stage
* * * *Tropical depression (dissipation) stage
○Position at 7:00 a.m. E.S.T
●Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 33 1-64


U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1966
NUMBER TYPE NAME DATE
1 (H) ALMA Jun. 4—14
2 (H) BECKY Jul. 1—3
3 (H) CELIA Jul. 13—21
4 (H) DOROTHY Jul. 22—31
5 (T) ELLA Jul. 22—28
6 (H) FAITH Aug. 20—Sep. 7
7 (T) GRETA Sep. 1—7
8 (T) HALLIE Sep. 20—21
9 (H) INEZ Sep. 21—Oct. 11
10 (T) JUDITH Sep. 26—30
11 (H) LOIS Nov. 4—13
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
or hurricane.
······Tropical depression (development) stage
———Tropical storm stage
——Hurricane stage
++++Extratropical stage
✱✱✱✱Tropical depression (dissipation) stage
○Position at 7:00 a.m. E.S.T
●Position at 7:00 p.m. E.S.T.
HURRICANE "FAITH" INSERT
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

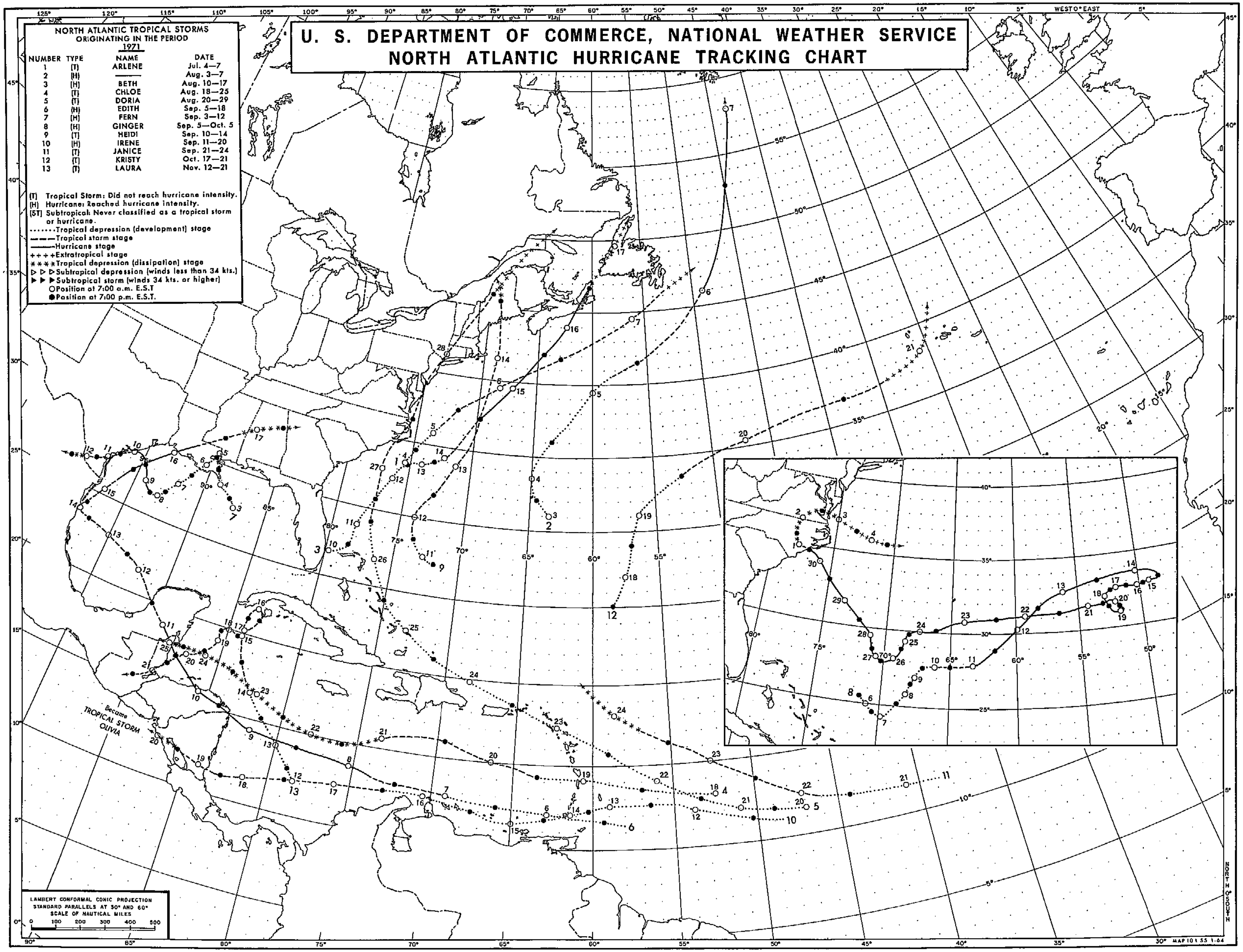

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1967
NUMBER TYPE NAME DATE
1 (H) ARLENE Aug. 28—Sep. 4
2 (H) BEULAH Sep. 5—22
3 (H) CHLOE Sep. 4—21
4 (H) DORIA Sep. 7—21
5 (T) EDITH Sep. 26—Oct. 1
6 (H) FERN Oct. 1—4
7 (T) GINGER Oct. 5—8
8 (H) HEIDI Oct. 19—Nov. 1
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
MAP 10 L 55 1-64

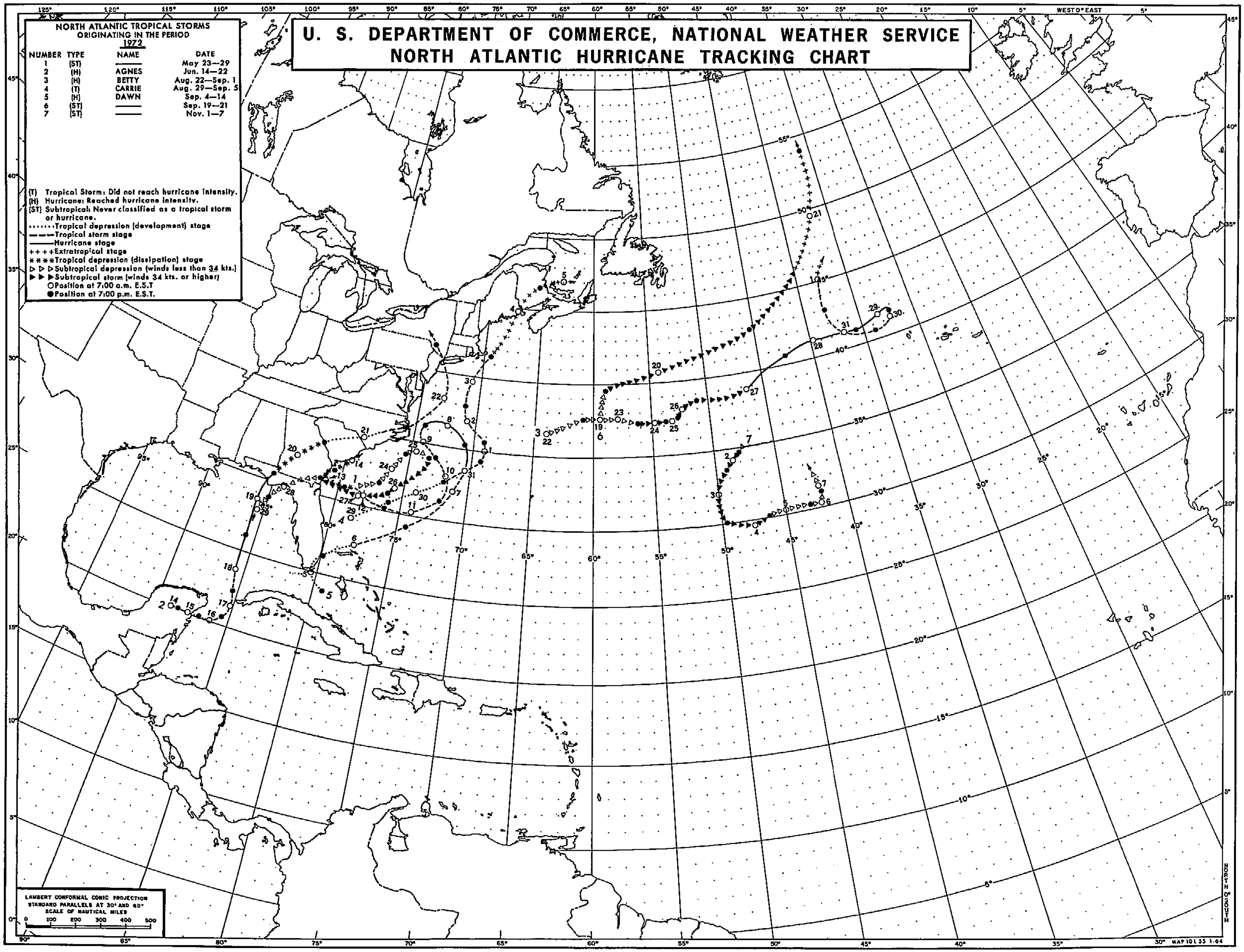

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1968
NUMBER TYPE NAME DATE
1 (H) ABBY Jun. 1—13
2 (H) BRENDA Jun. 17—26
3 (T) CANDY Jun. 22—26
4 (H) DOLLY Aug. 9—16
5 (T) EDNA Sep. 11—19
6 (ST) —— Sep. 14—23
7 (T) FRANCES Sep. 23—30
8 (H) GLADYS Oct. 13—21
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

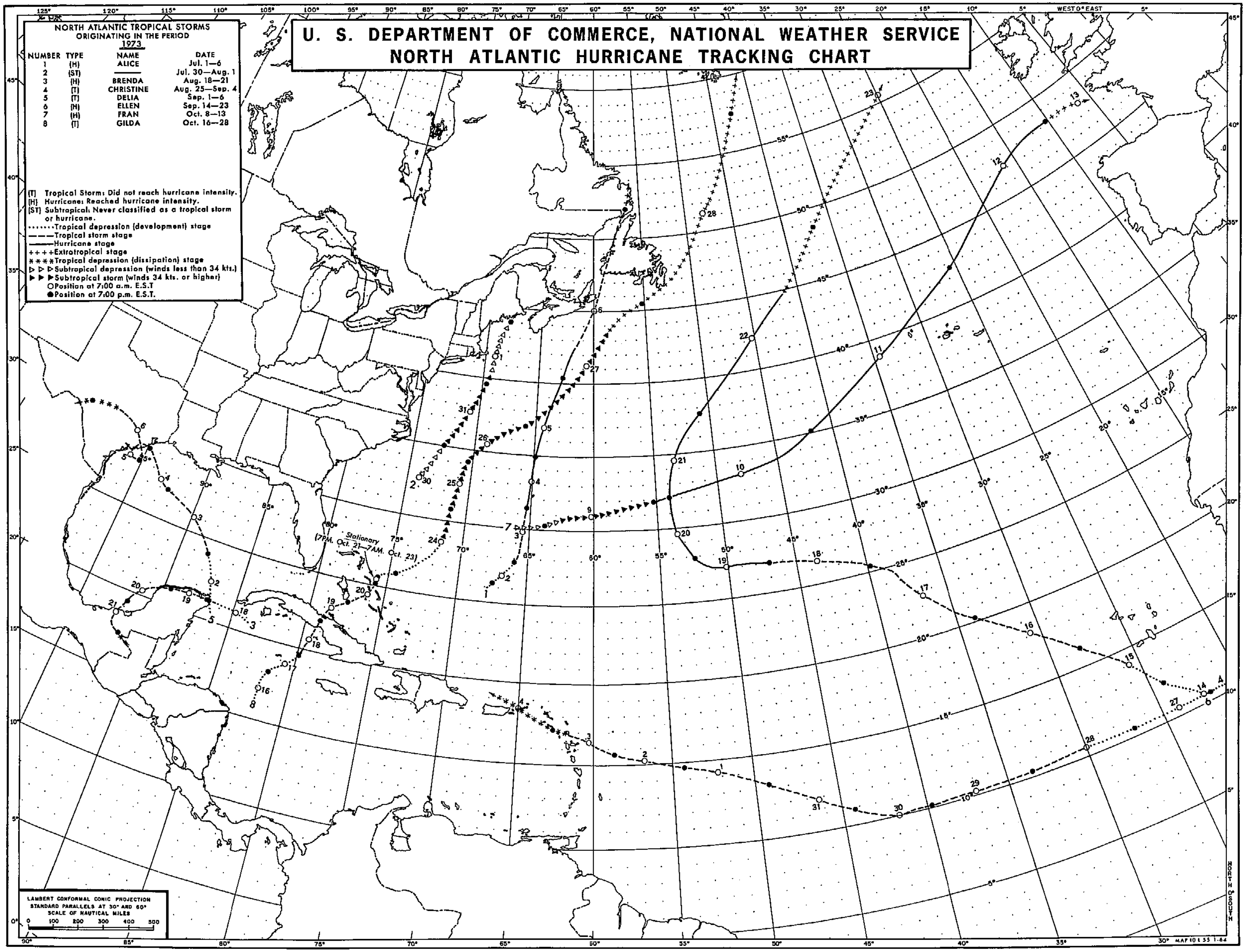

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1969
NUMBER TYPE NAME DATE
1 (T) ANNA Jul. 25—Aug. 5
2 (H) BLANCHE Aug. 10—13
3 (H) CAMILLE Aug. 14—22
4 (H) DEBBIE Aug. 14—25
5 (T) EVE Aug. 24—27
6 (H) FRANCELIA Aug. 28—Sep. 4
7 (H) GERDA Sep. 5—10
8 (H) HOLLY Sep. 14—20
9 (H) INGA Sep. 20—Oct. 14
10 (H) —— Sep. 21—25
11 (T) —— Sep. 24—29
12 (ST) —— Sep. 29—Oct. 1
13 (T) JENNY Oct. 1—6
14 (H) KARA Oct. 7—19
15 (H) LAURIE Oct. 16—27
NUMBER TYPE NAME DATE
16 (T) —— Oct. 28—31
17 (H) —— Oct. 30—Nov. 6
18 (H) MARTHA Nov. 21—25
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T.
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

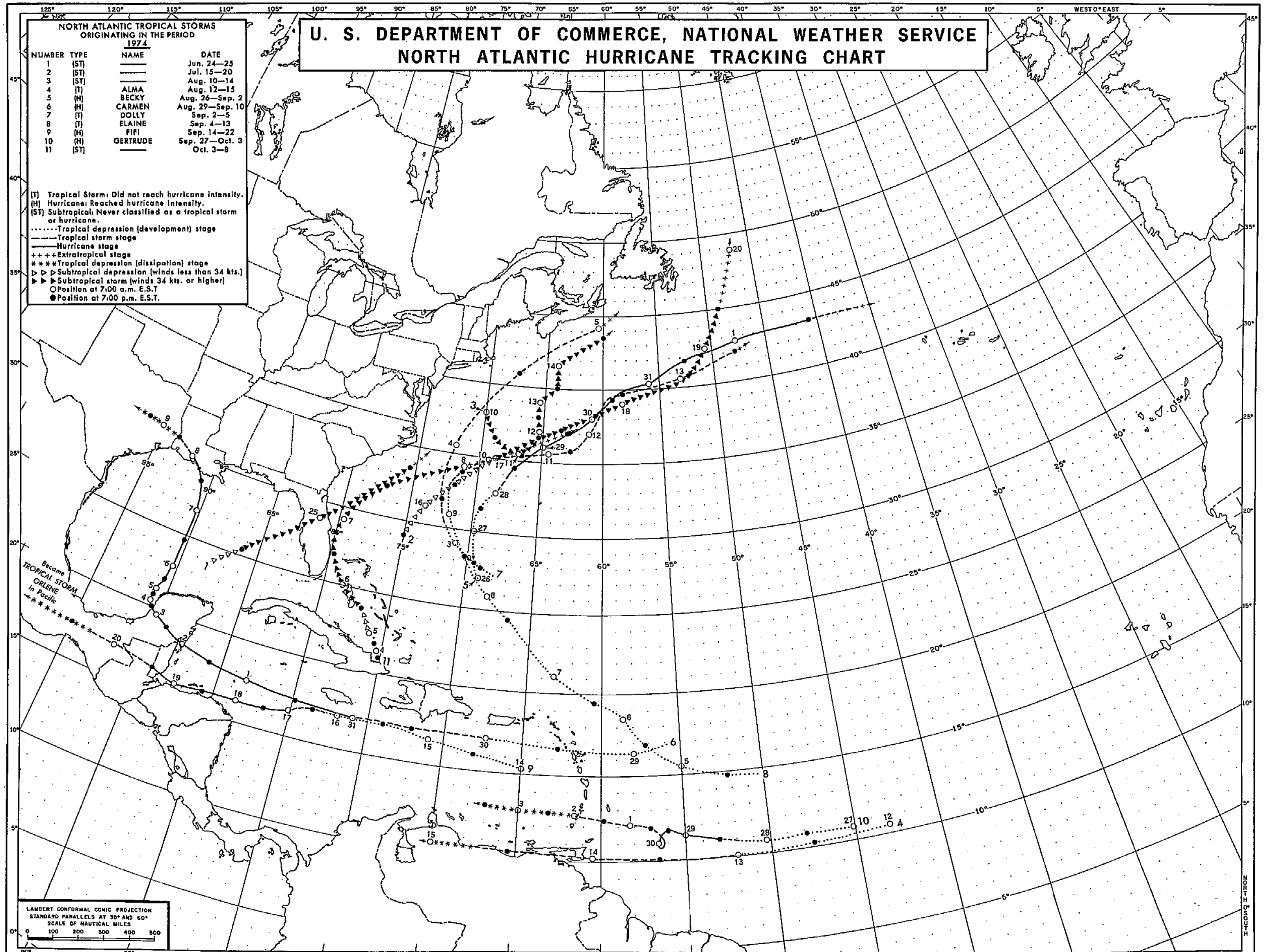


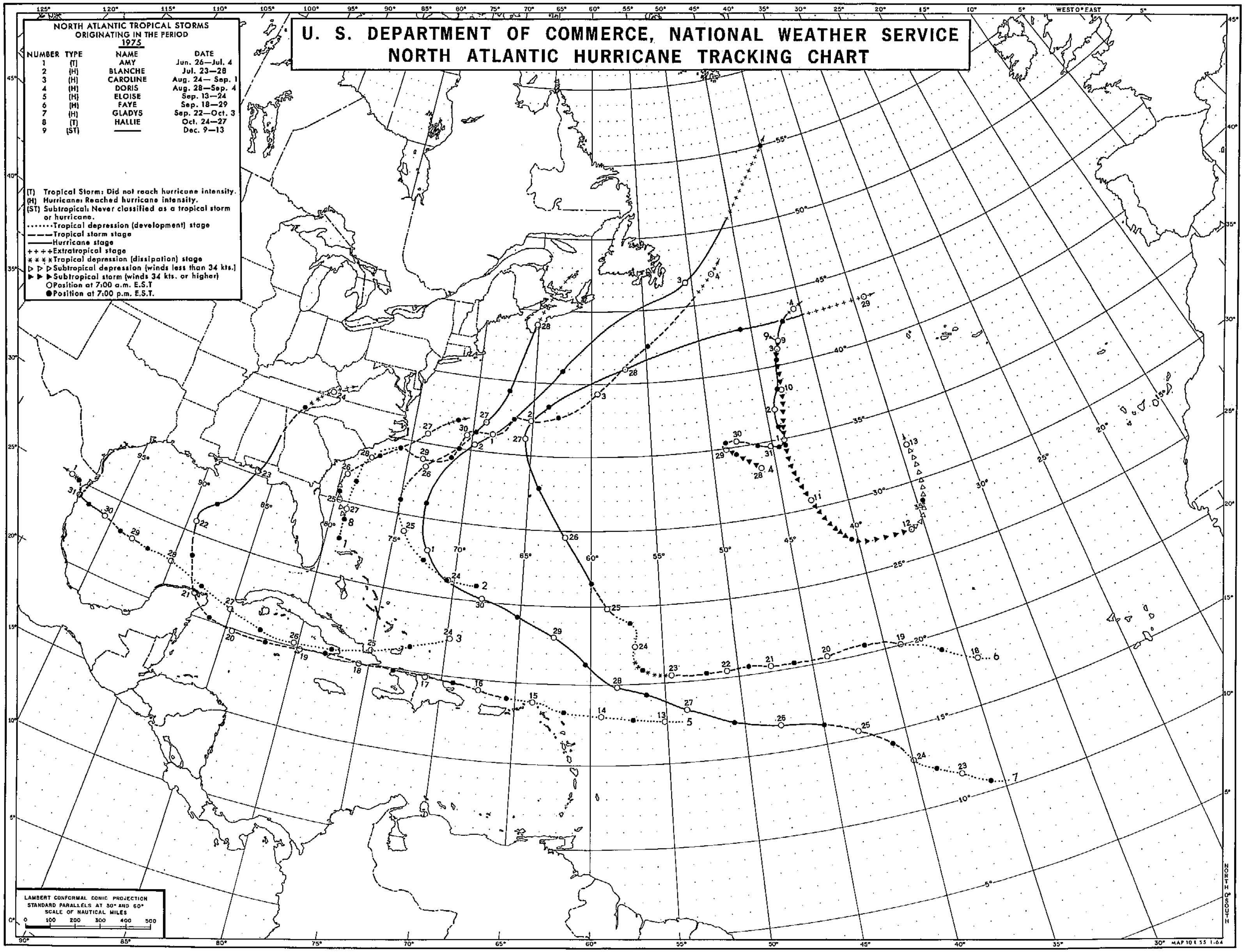
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1970
NUMBER TYPE NAME DATE
1 (H) ALMA May 17—27
2 (T) BECKY Jul. 18—23
3 (H) CELIA Jul. 30—Aug. 5
4 (T) —— Aug. 15—18
5 (T) DOROTHY Aug. 17—23
6 (H) ELLA Sep. 8—13
7 (T) FELICE Sep. 11—17
8 (T) GRETA Sep. 26—Oct. 4
9 (H) —— Oct. 12—17
10 (H) —— Oct. 20—28
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
Stationary
(7AM. Oct. 21—7AM. Oct. 22)
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST

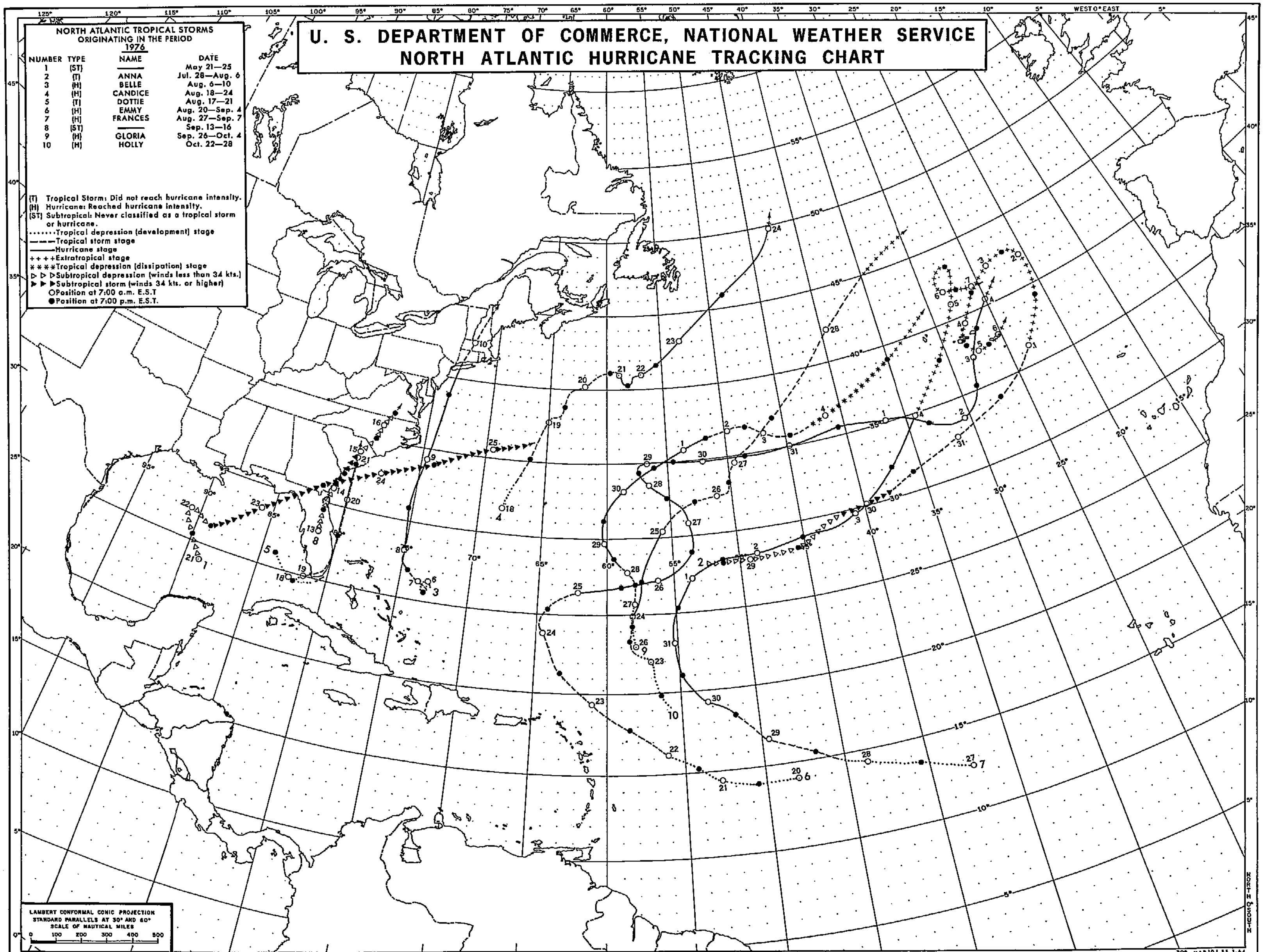

U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1971
NUMBER TYPE NAME DATE
1 (T) ARLENE Jul. 4—7
2 (H) —— Aug. 3—7
3 (H) BETH Aug. 10—17
4 (T) CHLOE Aug. 18—25
5 (T) DORIA Aug. 20—29
6 (H) EDITH Sep. 5—18
7 (H) FERN Sep. 3—12
8 (H) GINGER Sep. 5—Oct. 5
9 (T) HEIDI Sep. 10—14
10 (H) IRENE Sep. 11—20
11 (T) JANICE Sep. 21—24
12 (T) KRISTY Oct. 17—21
13 (T) LAURA Nov. 12—21
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
Became TROPICAL STORM OLIVIA
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1972
NUMBER TYPE NAME DATE
1 (ST) —— May 23—29
2 (H) AGNES Jun. 14—22
3 (H) BETTY Aug. 22—Sep. 1
4 (T) CARRIE Aug. 29—Sep. 5
5 (H) DAWN Sep. 4—14
6 (ST) —— Sep. 19—21
7 (ST) —— Nov. 1—7
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

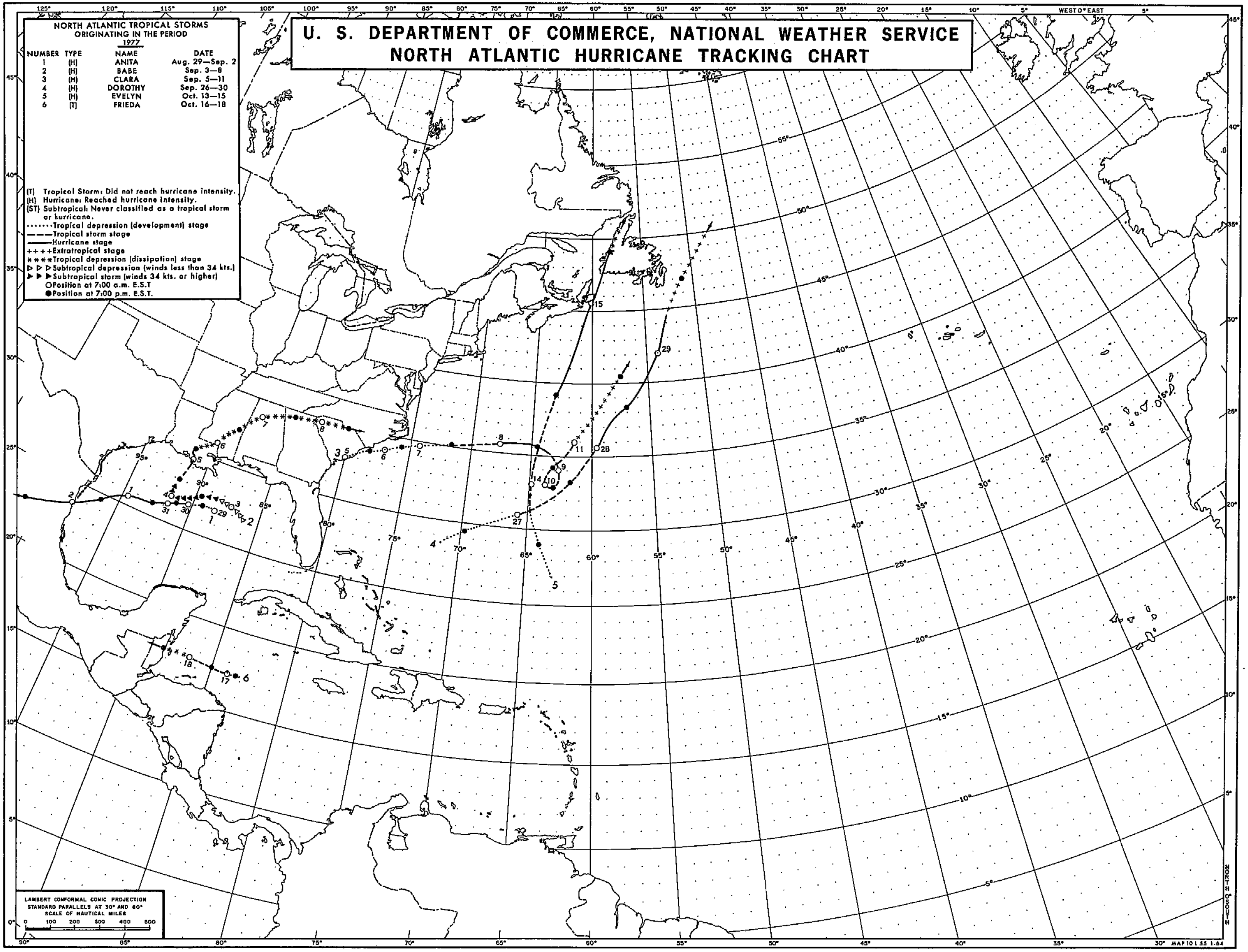

U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1973
NUMBER TYPE NAME DATE
1 (H) ALICE Jul. 1—6
2 (ST) —— Jul. 30—Aug. 1
3 (H) BRENDA Aug. 18—21
4 (T) CHRISTINE Aug. 25—Sep. 4
5 (T) DELIA Sep. 1—6
6 (H) ELLEN Sep. 14—23
7 (H) FRAN Oct. 8—13
8 (T) GILDA Oct. 16—28
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
·······Tropical depression (development) stage
– – –Tropical storm stage
——Hurricane stage
+ + + +Extratropical stage
* * * *Tropical depression (dissipation) stage
▷ ▷ ▷Subtropical depression (winds less than 34 kts.)
▶ ▶ ▶Subtropical storm (winds 34 kts. or higher)
○Position at 7:00 a.m. E.S.T
●Position at 7:00 p.m. E.S.T.
Stationary (7P.M. Oct. 21—7AM. Oct. 23)
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1974
NUMBER TYPE NAME DATE
1 (ST) —— Jun. 24—25
2 (ST) —— Jul. 15—20
3 (ST) —— Aug. 10—14
4 (T) ALMA Aug. 12—15
5 (H) BECKY Aug. 26—Sep. 2
6 (H) CARMEN Aug. 29—Sep. 10
7 (T) DOLLY Sep. 2—5
8 (T) ELAINE Sep. 4—13
9 (H) FIFI Sep. 14—22
10 (H) GERTRUDE Sep. 27—Oct. 3
11 (ST) —— Oct. 3—8
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
·······Tropical depression (development) stage
———Tropical storm stage
——Hurricane stage
++++Extratropical stage
****Tropical depression (dissipation) stage
▷ ▷ ▷Subtropical depression (winds less than 34 kts.)
▶ ▶ ▶Subtropical storm (winds 34 kts. or higher)
○Position at 7:00 a.m. E.S.T
●Position at 7:00 p.m. E.S.T.
Became TROPICAL STORM ORLENE in Pacific
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH SOUTH
WEST 0° EAST

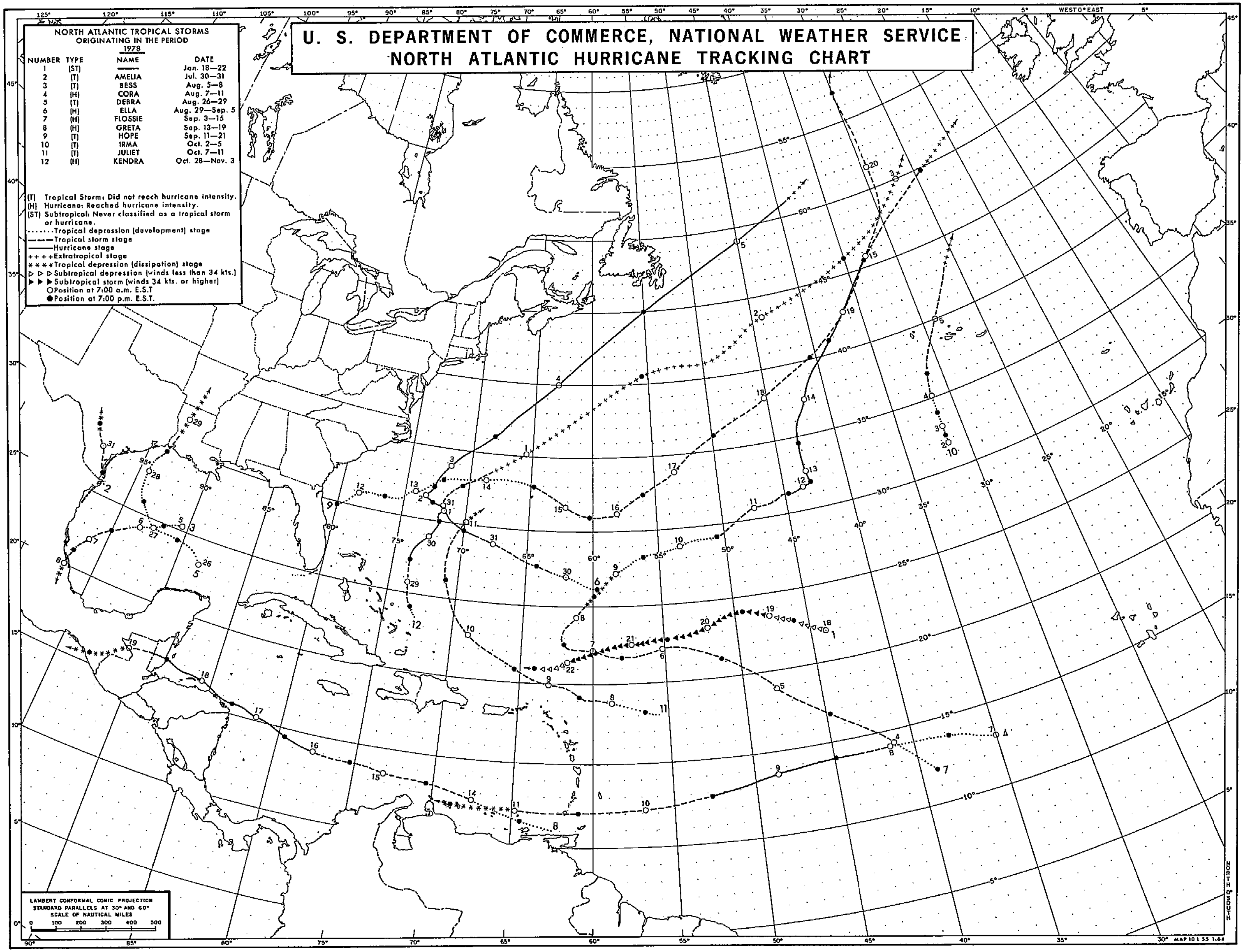

U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1975
NUMBER TYPE NAME DATE
1 (T) AMY Jun. 26—Jul. 4
2 (H) BLANCHE Jul. 23—28
3 (H) CAROLINE Aug. 24— Sep. 1
4 (H) DORIS Aug. 28—Sep. 4
5 (H) ELOISE Sep. 13—24
6 (H) FAYE Sep. 18—29
7 (H) GLADYS Sep. 22—Oct. 3
8 (T) HALLIE Oct. 24—27
9 (ST) —— Dec. 9—13
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH SOUTH

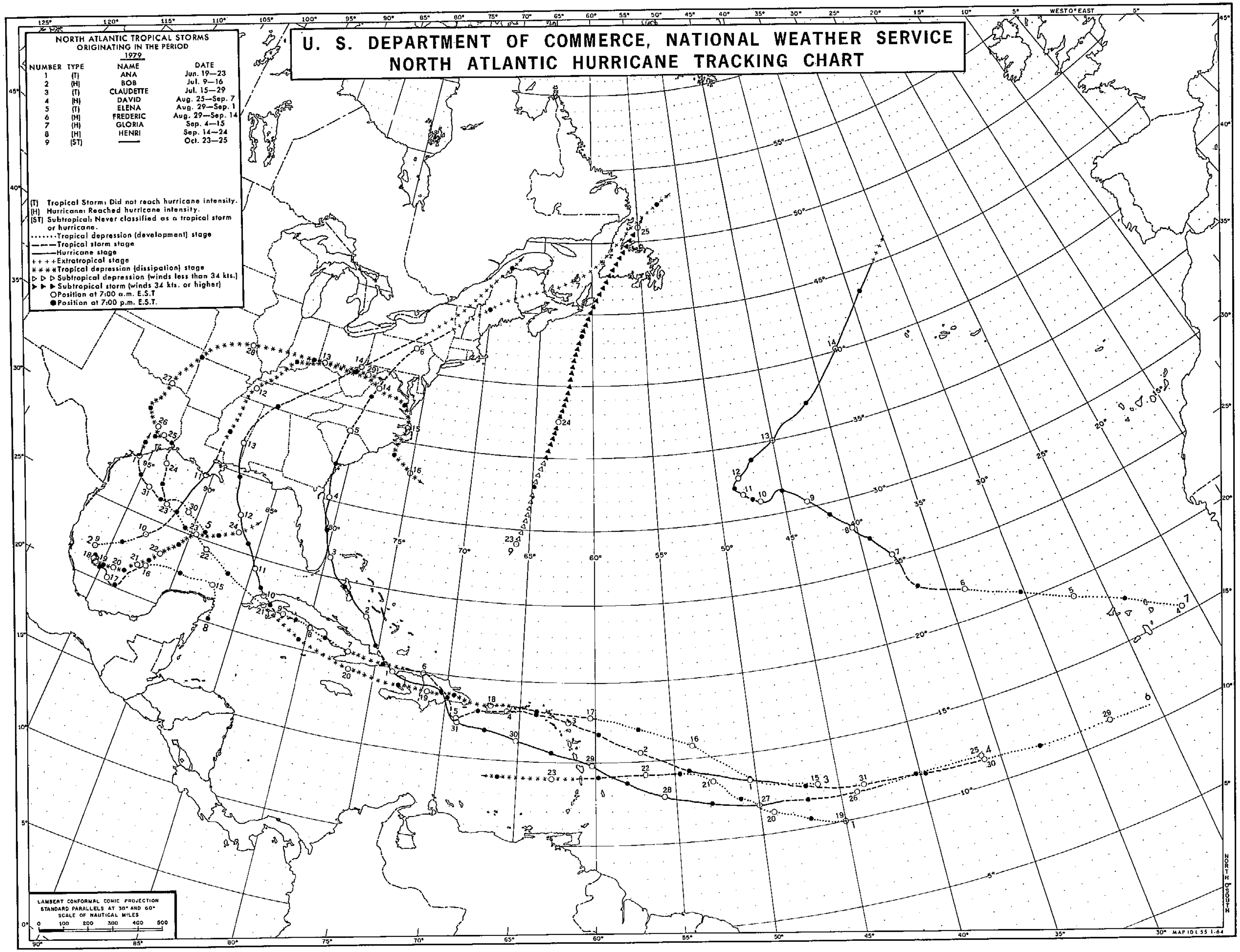


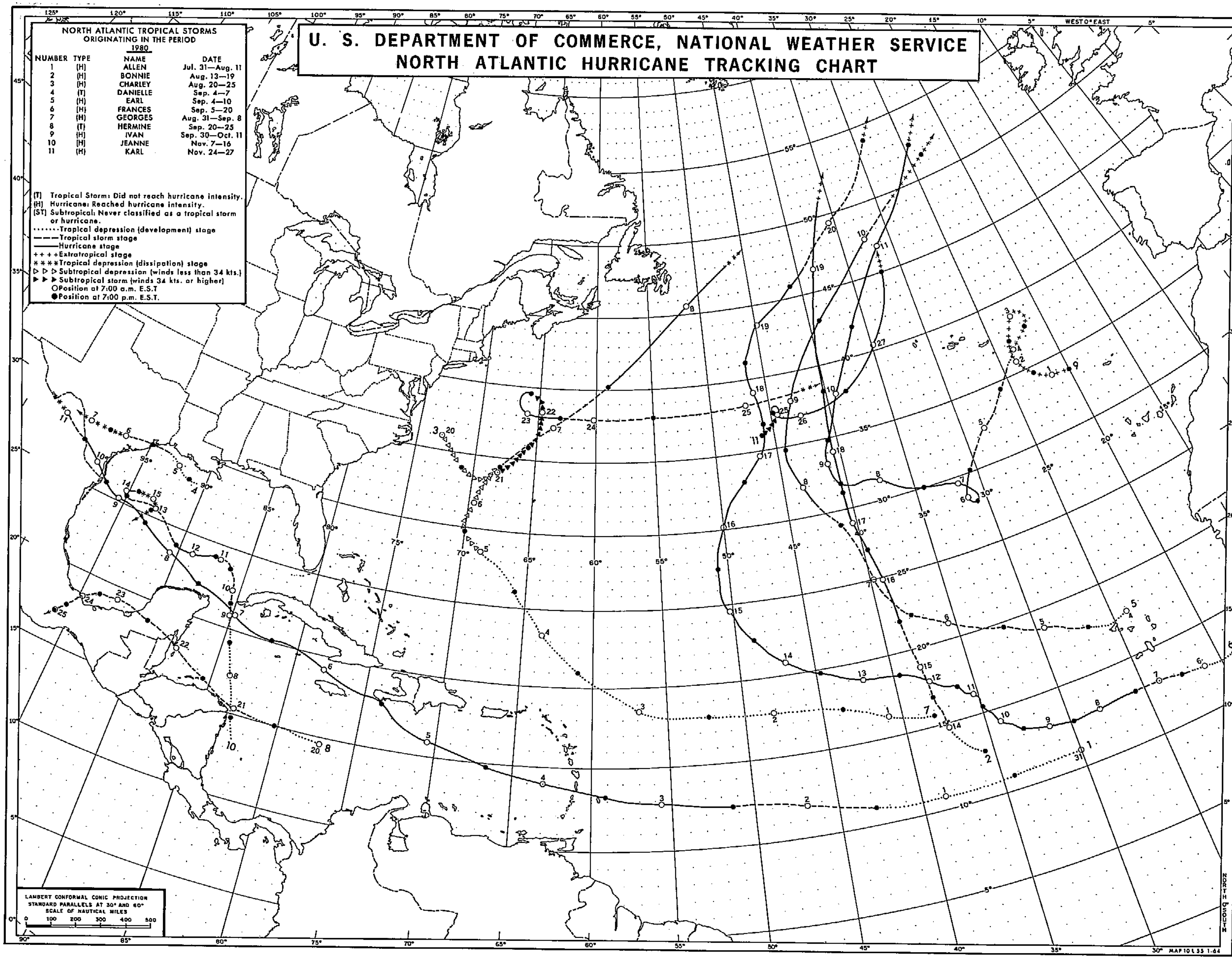
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1976
NUMBER TYPE NAME DATE
1 (ST) —— May 21—25
2 (T) ANNA Jul. 28—Aug. 6
3 (H) BELLE Aug. 6—10
4 (H) CANDICE Aug. 18—24
5 (T) DOTTIE Aug. 17—21
6 (H) EMMY Aug. 20—Sep. 4
7 (H) FRANCES Aug. 27—Sep. 7
8 (ST) —— Sep. 13—16
9 (H) GLORIA Sep. 26—Oct. 4
10 (H) HOLLY Oct. 22—28
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500



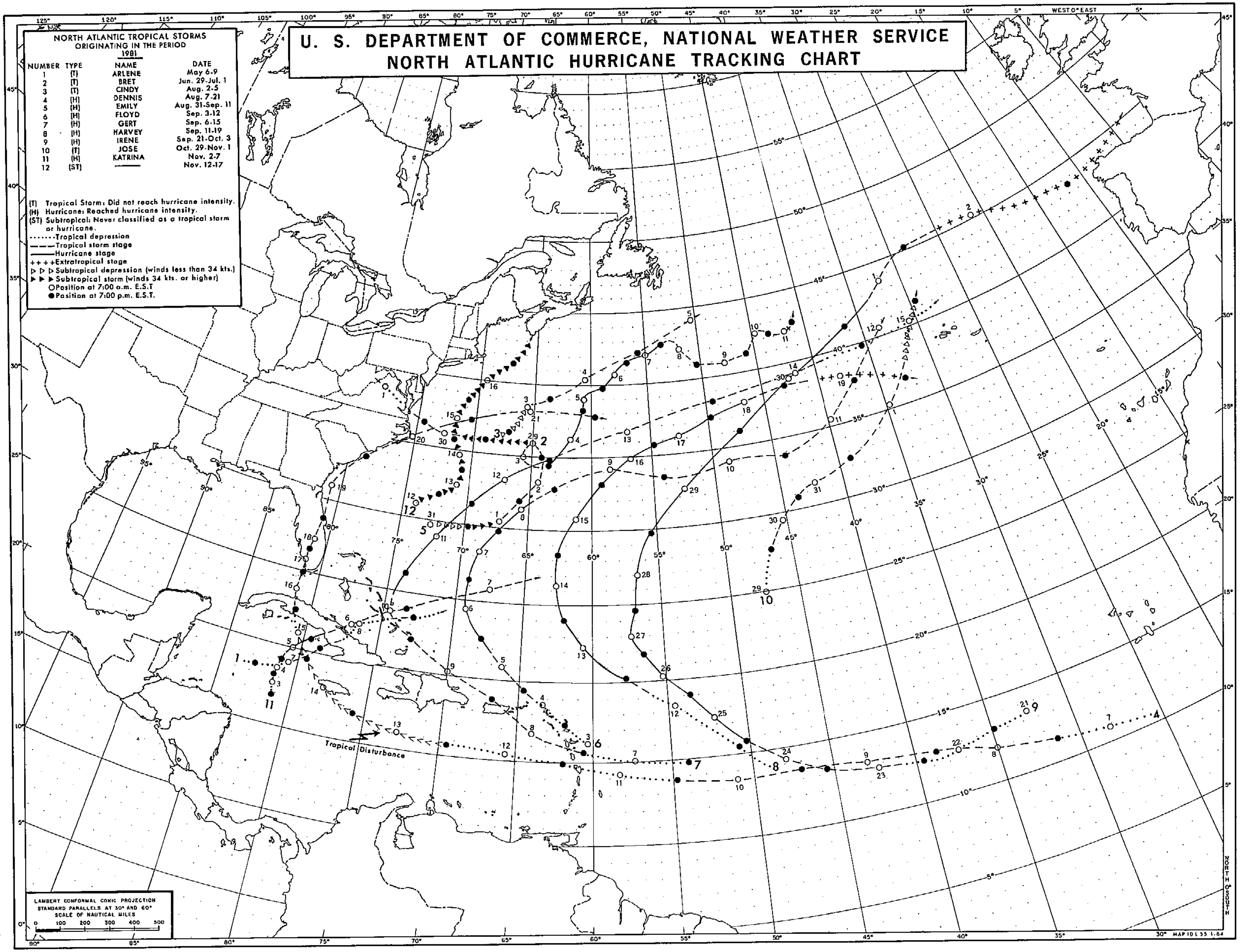
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS ORIGINATING IN THE PERIOD 1977
NUMBER TYPE NAME DATE
1 (H) ANITA Aug. 29—Sep. 2
2 (H) BABE Sep. 3—8
3 (H) CLARA Sep. 5—11
4 (H) DOROTHY Sep. 26—30
5 (H) EVELYN Oct. 13—15
6 (T) FRIEDA Oct. 16—18
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

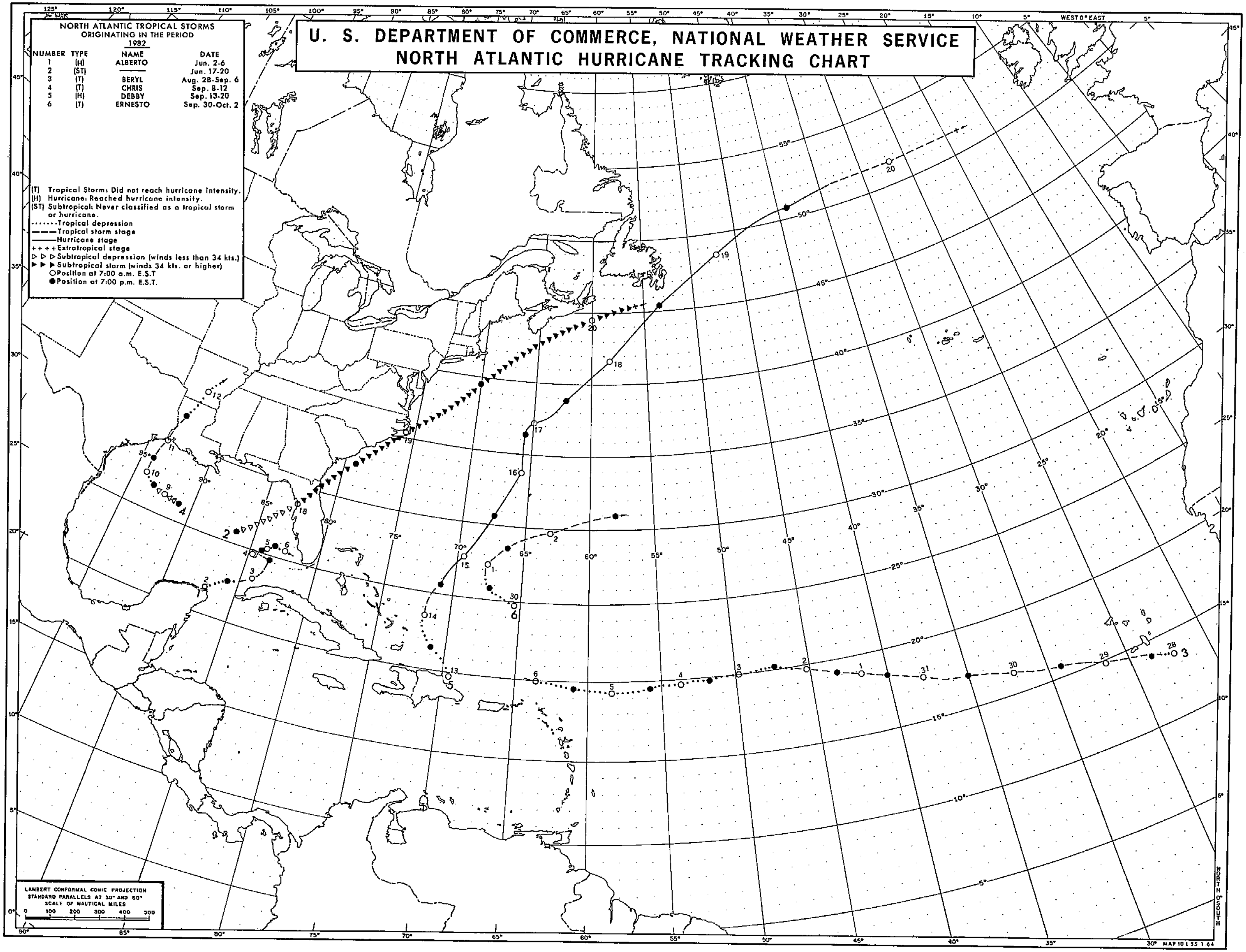

U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1978
NUMBER TYPE NAME DATE
1 (ST) —— Jan. 18—22
2 (T) AMELIA Jul. 30—31
3 (T) BESS Aug. 5—8
4 (H) CORA Aug. 7—11
5 (T) DEBRA Aug. 26—29
6 (H) ELLA Aug. 29—Sep. 5
7 (H) FLOSSIE Sep. 3—15
8 (H) GRETA Sep. 13—19
9 (T) HOPE Sep. 11—21
10 (T) IRMA Oct. 2—5
11 (T) JULIET Oct. 7—11
12 (H) KENDRA Oct. 28—Nov. 3
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES


U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1979
NUMBER TYPE NAME DATE
1 (T) ANA Jun. 19—23
2 (H) BOB Jul. 9—16
3 (T) CLAUDETTE Jul. 15—29
4 (H) DAVID Aug. 25—Sep. 7
5 (T) ELENA Aug. 29—Sep. 1
6 (H) FREDERIC Aug. 29—Sep. 14
7 (H) GLORIA Sep. 4—15
8 (H) HENRI Sep. 14—24
9 (ST) —— Oct. 23—25
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
NORTH SOUTH
WEST 0° EAST

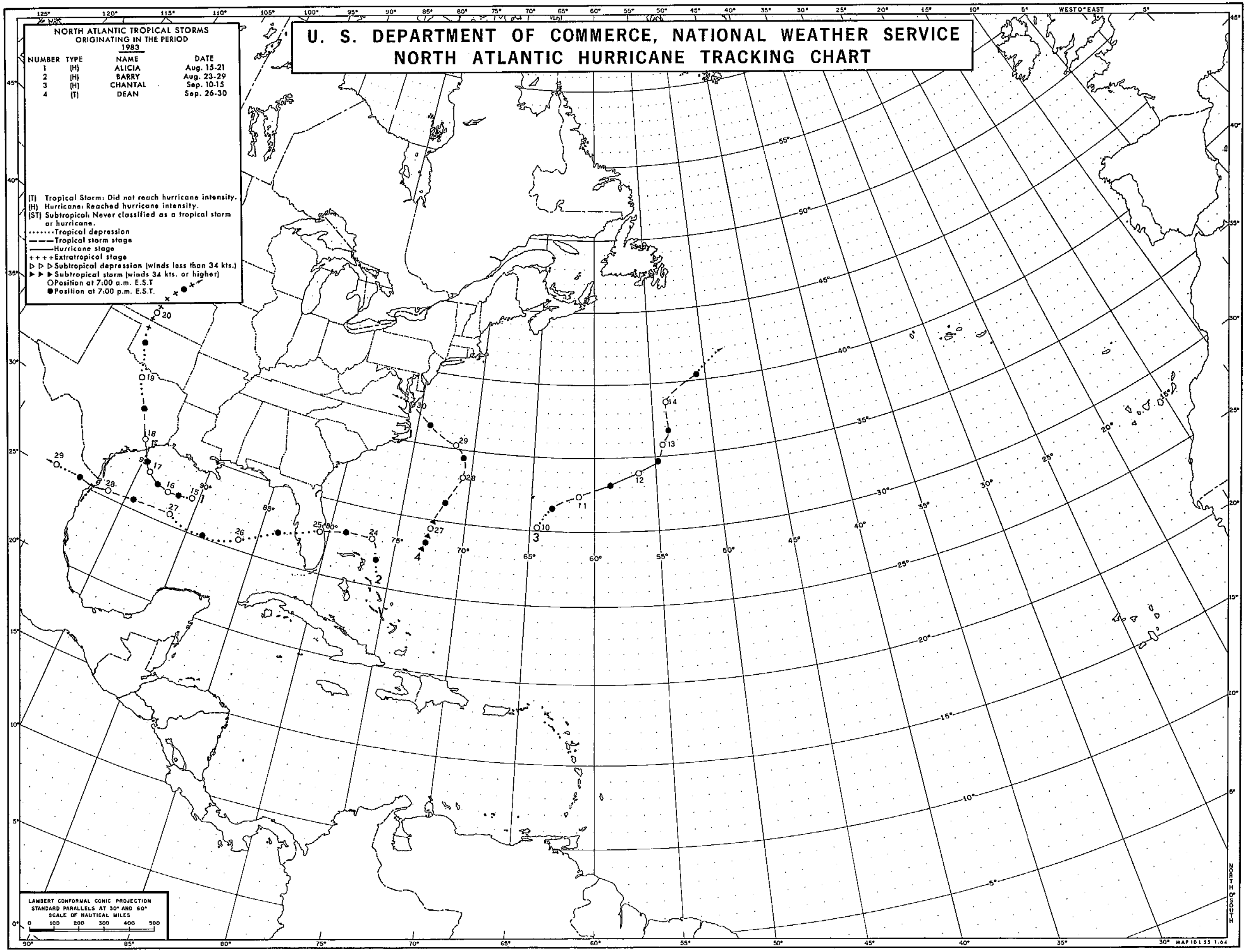


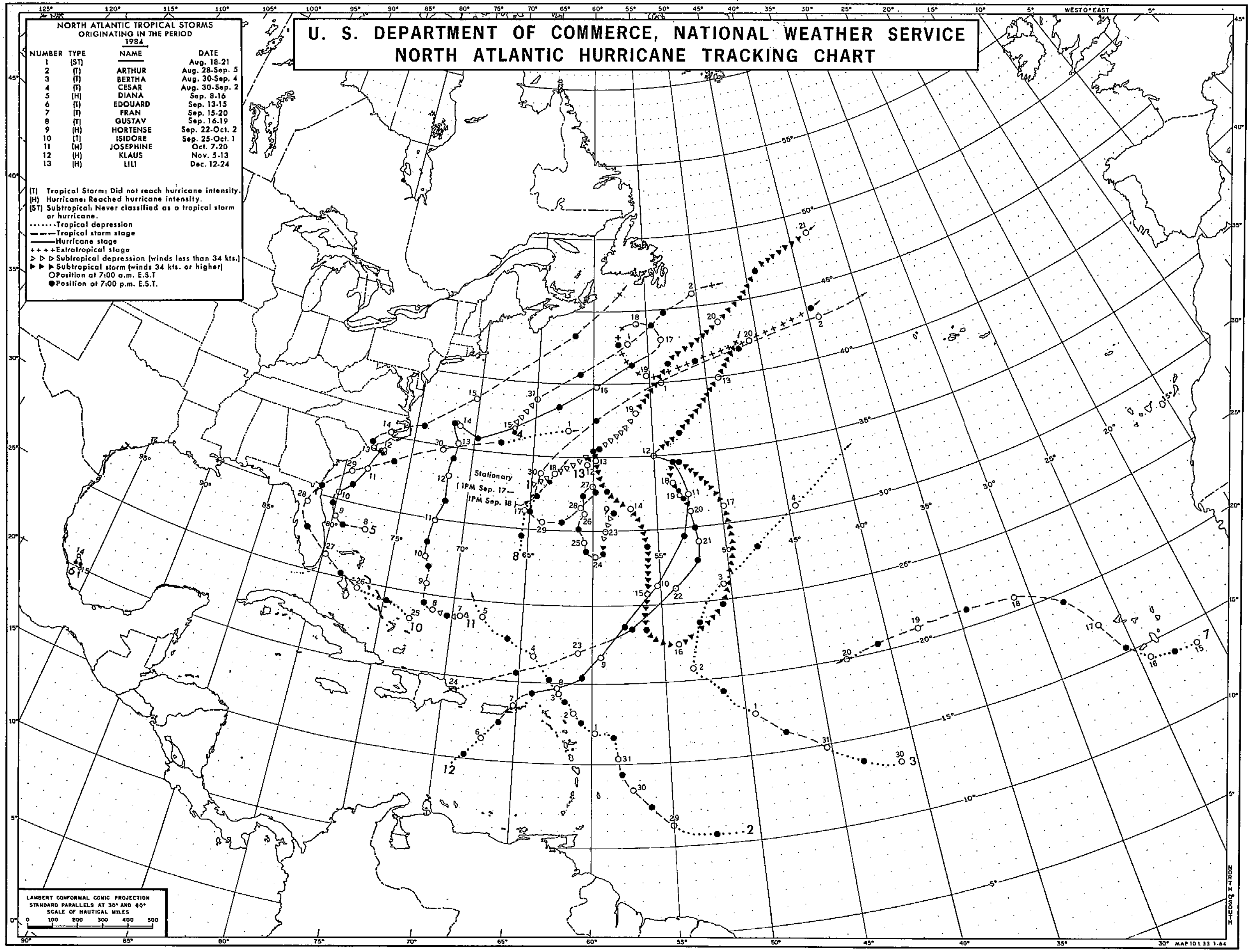
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1980
NUMBER TYPE NAME DATE
1 (H) ALLEN Jul. 31—Aug. 11
2 (H) BONNIE Aug. 13—19
3 (H) CHARLEY Aug. 20—25
4 (T) DANIELLE Sep. 4—7
5 (H) EARL Sep. 4—10
6 (H) FRANCES Sep. 5—20
7 (H) GEORGES Aug. 31—Sep. 8
8 (T) HERMINE Sep. 20—25
9 (H) IVAN Sep. 30—Oct. 11
10 (H) JEANNE Nov. 7—16
11 (H) KARL Nov. 24—27
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression (development) stage
Tropical storm stage
Hurricane stage
Extratropical stage
Tropical depression (dissipation) stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500


U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1981
NUMBER TYPE NAME DATE
1 (T) ARLENE May 6-9
2 (T) BRET Jun. 29-Jul. 1
3 (T) CINDY Aug. 2-5
4 (H) DENNIS Aug. 7-21
5 (H) EMILY Aug. 31-Sep. 11
6 (H) FLOYD Sep. 3-12
7 (H) GERT Sep. 6-15
8 (H) HARVEY Sep. 11-19
9 (H) IRENE Sep. 21-Oct. 3
10 (T) JOSE Oct. 29-Nov. 1
11 (H) KATRINA Nov. 2-7
12 (ST) —— Nov. 12-17
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression
Tropical storm stage
Hurricane stage
Extratropical stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
Tropical Disturbance
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

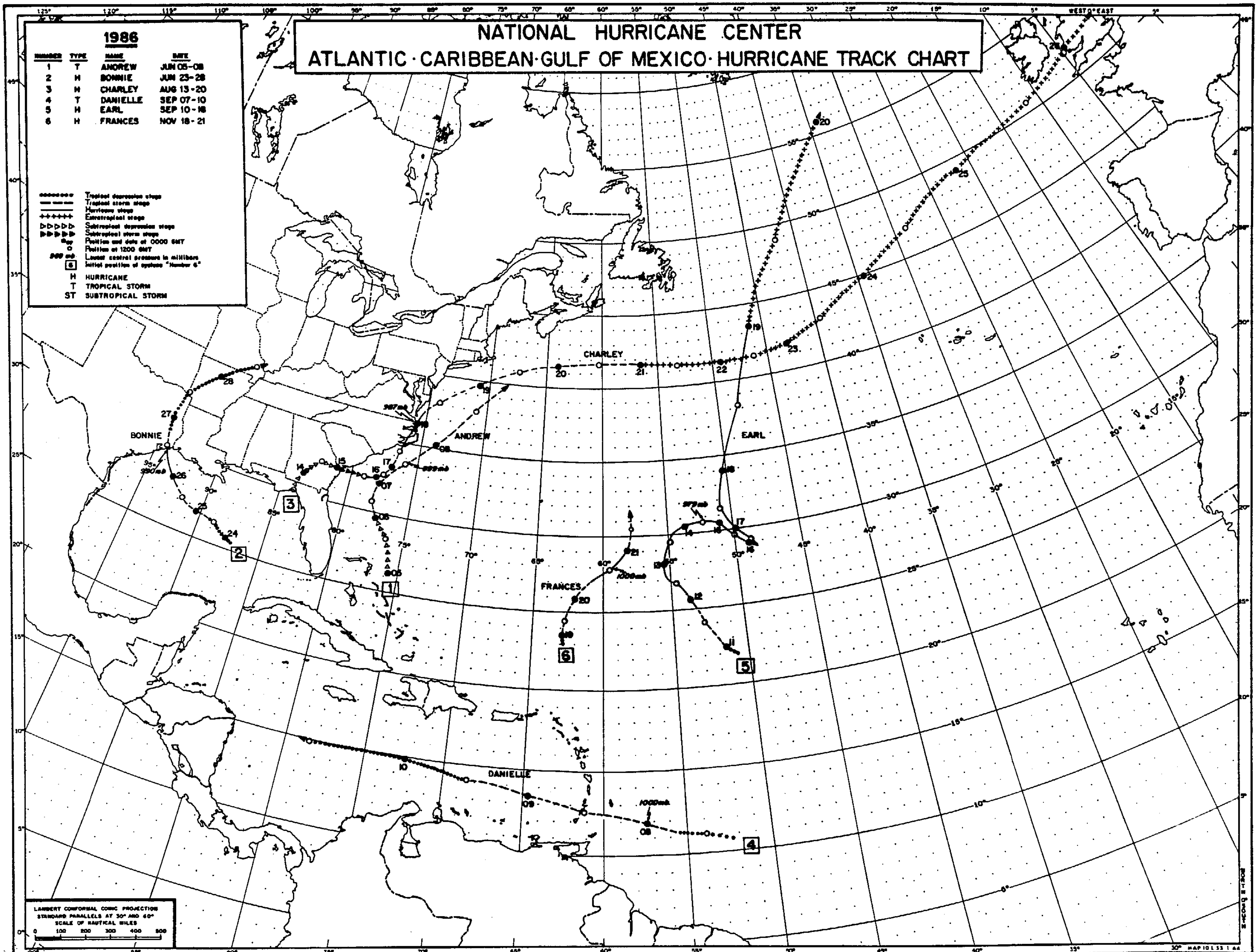


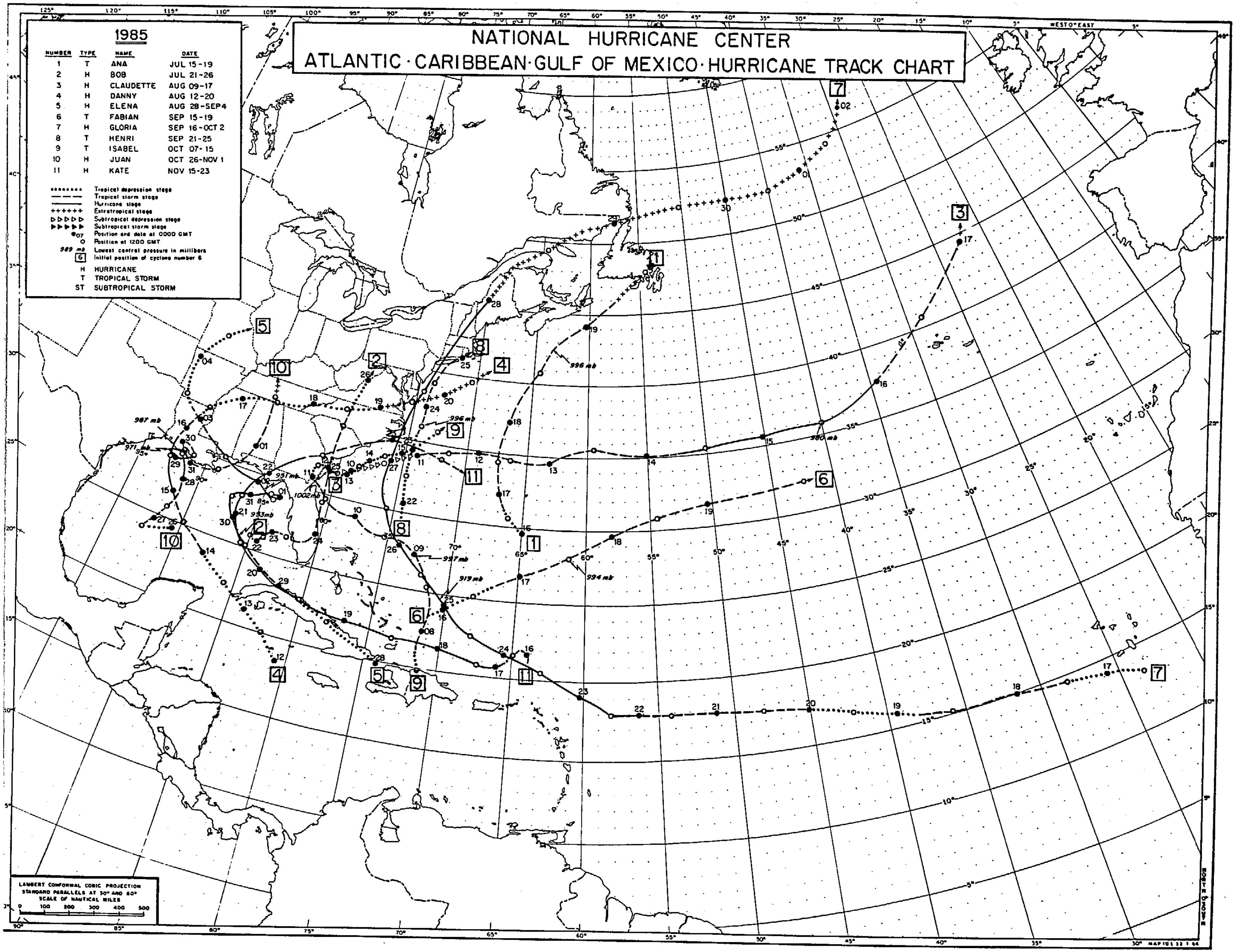
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1982
NUMBER TYPE NAME DATE
1 (H) ALBERTO Jun. 2-6
2 (ST) —— Jun. 17-20
3 (T) BERYL Aug. 28-Sep. 6
4 (T) CHRIS Sep. 8-12
5 (H) DEBBY Sep. 13-20
6 (T) ERNESTO Sep. 30-Oct. 2
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
·······Tropical depression
– – –Tropical storm stage
——Hurricane stage
+ + + +Extratropical stage
▷ ▷ ▷ Subtropical depression (winds less than 34 kts.)
▶ ▶ ▶ Subtropical storm (winds 34 kts. or higher)
○Position at 7:00 a.m. E.S.T
●Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
WEST 0° EAST
NORTH 0° SOUTH
MAP 10 L 55 1-64


U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1983
NUMBER TYPE NAME DATE
1 (H) ALICIA Aug. 15-21
2 (H) BARRY Aug. 23-29
3 (H) CHANTAL Sep. 10-15
4 (T) DEAN Sep. 26-30
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression
Tropical storm stage
Hurricane stage
Extratropical stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH 0° SOUTH

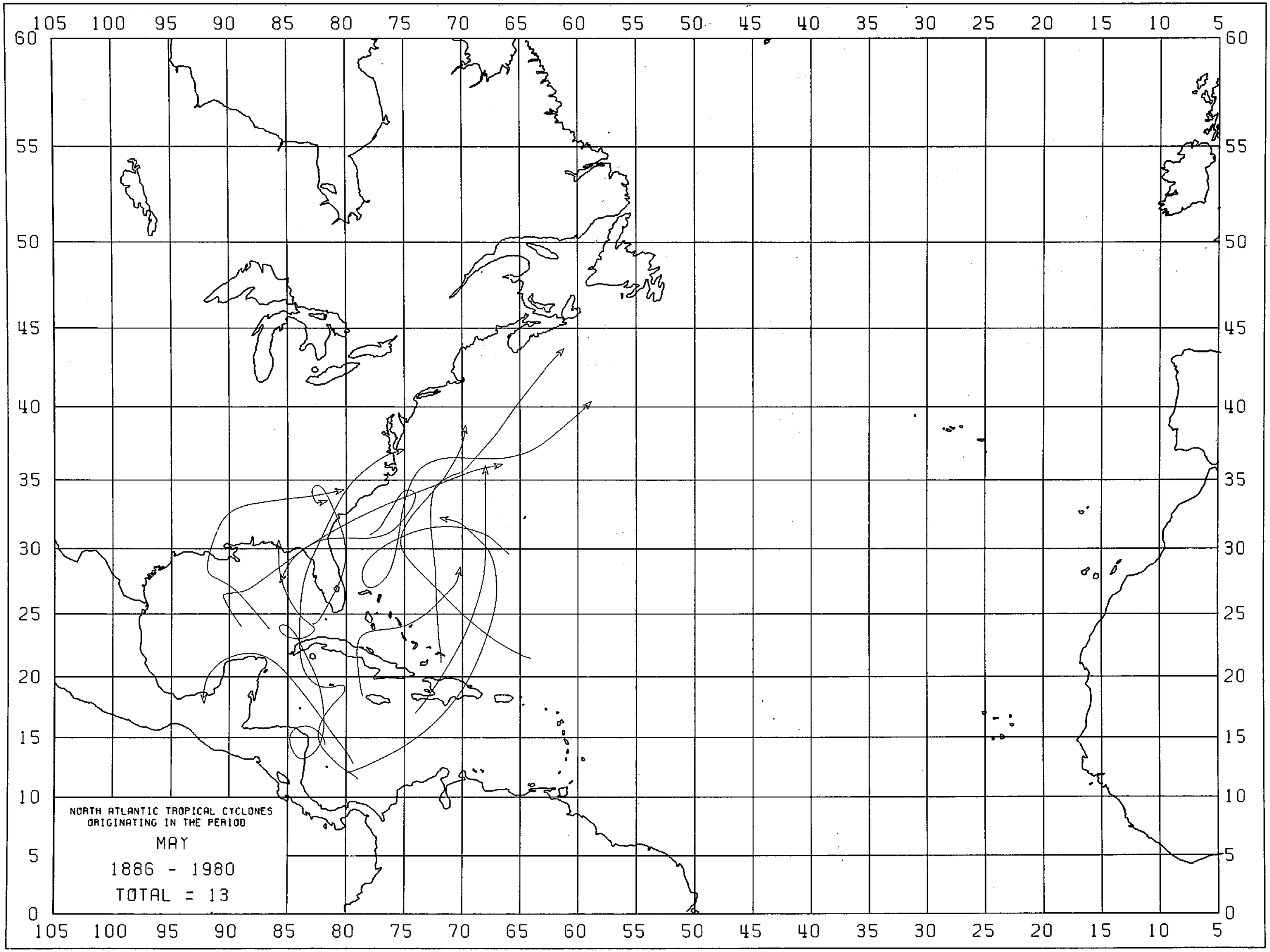


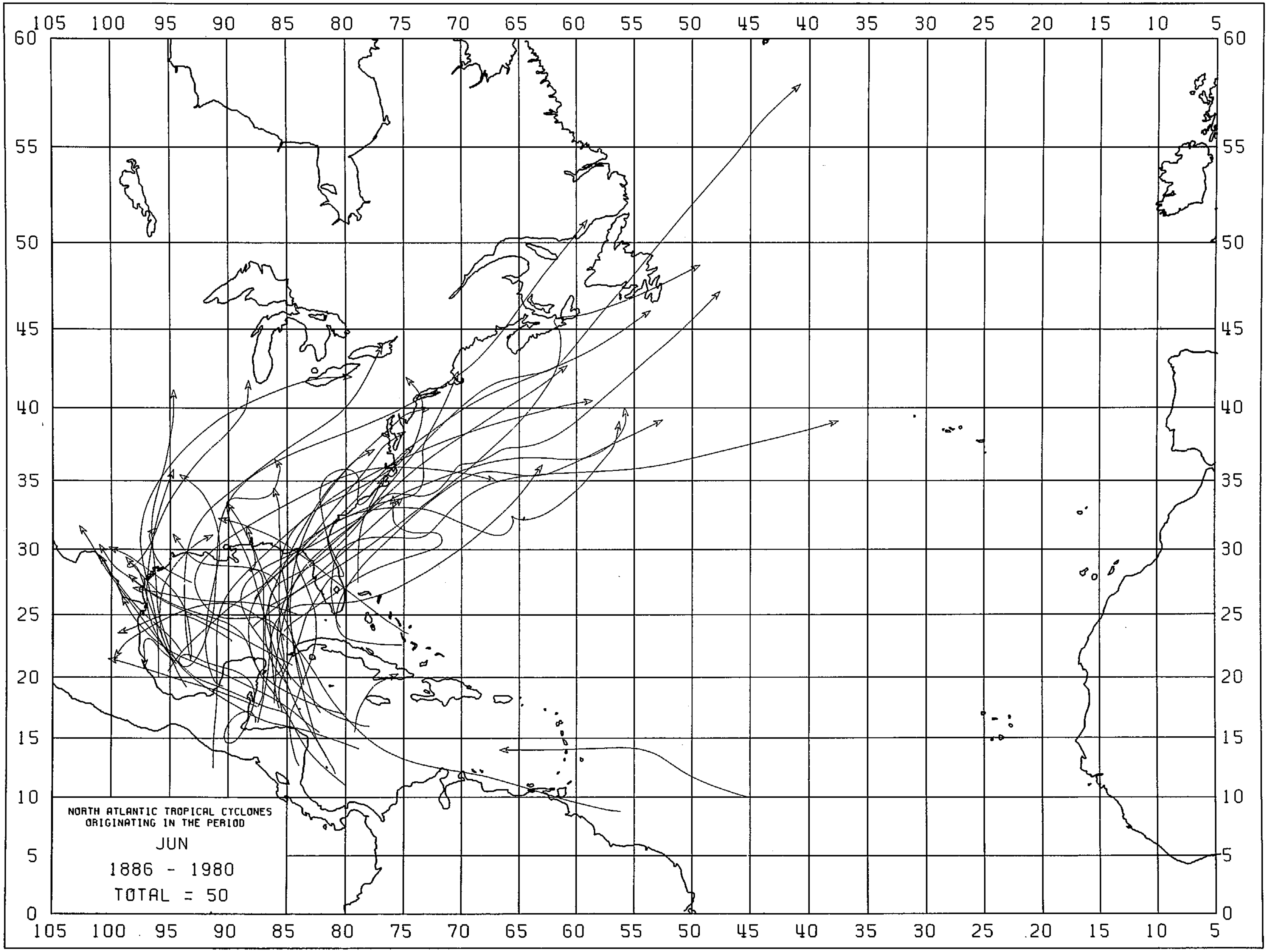
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART
NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1984
NUMBER TYPE NAME DATE
1 (ST) — Aug. 18-21
2 (T) ARTHUR Aug. 28-Sep. 5
3 (T) BERTHA Aug. 30-Sep. 4
4 (T) CESAR Aug. 30-Sep. 2
5 (H) DIANA Sep. 8-16
6 (T) EDOUARD Sep. 13-15
7 (T) FRAN Sep. 15-20
8 (T) GUSTAV Sep. 16-19
9 (H) HORTENSE Sep. 22-Oct. 2
10 (T) ISIDORE Sep. 25-Oct. 1
11 (H) JOSEPHINE Oct. 7-20
12 (H) KLAUS Nov. 5-13
13 (H) LILI Dec. 12-24
(T) Tropical Storm: Did not reach hurricane intensity.
(H) Hurricane: Reached hurricane intensity.
(ST) Subtropical: Never classified as a tropical storm or hurricane.
Tropical depression
Tropical storm stage
Hurricane stage
Extratropical stage
Subtropical depression (winds less than 34 kts.)
Subtropical storm (winds 34 kts. or higher)
Position at 7:00 a.m. E.S.T
Position at 7:00 p.m. E.S.T.
Stationary
1PM Sep. 17—
1PM Sep. 18
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST 0° EAST
NORTH SOUTH

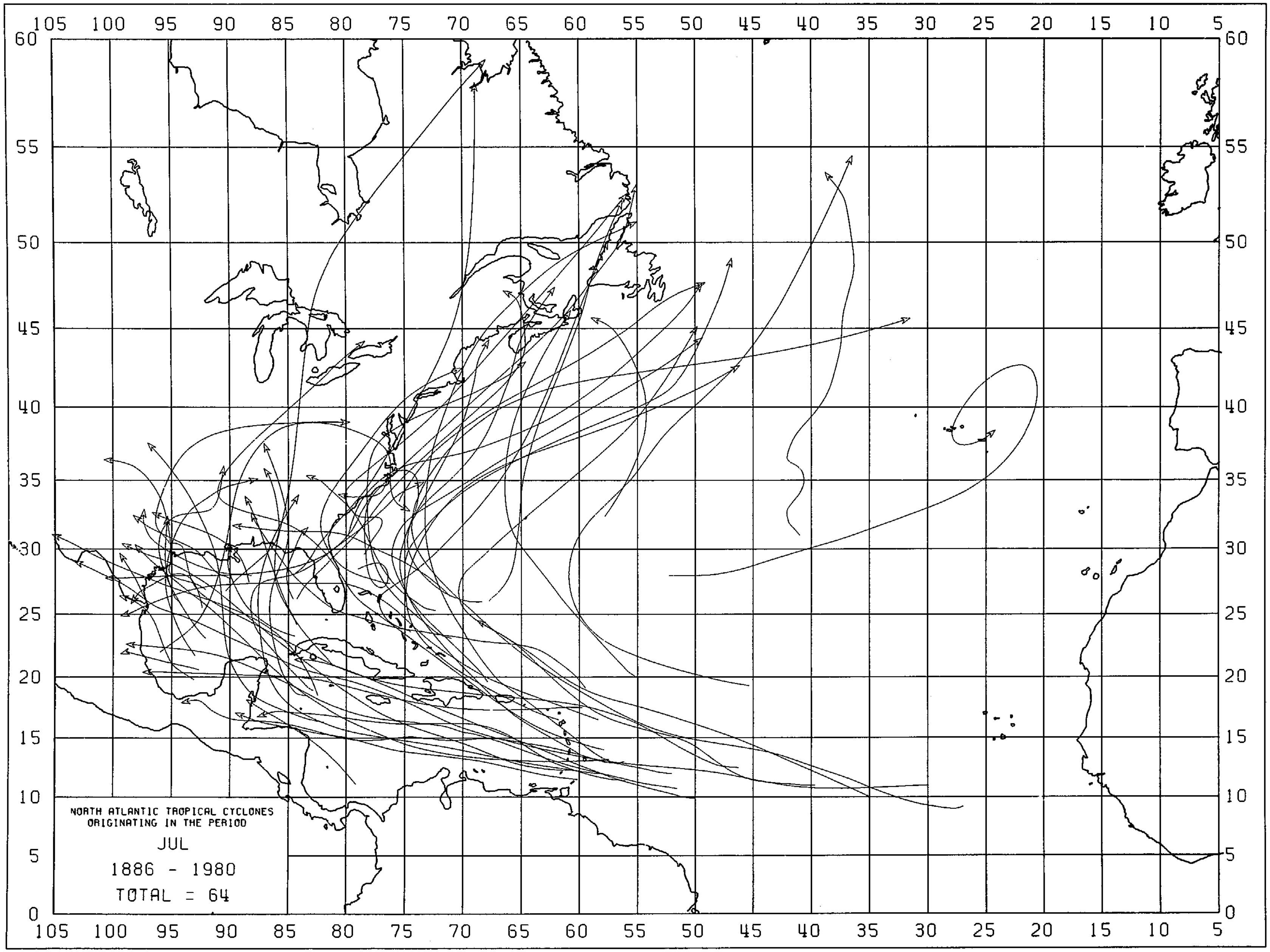

NATIONAL HURRICANE CENTER
ATLANTIC · CARIBBEAN · GULF OF MEXICO · HURRICANE TRACK CHART
1986
TYPE
1 T ANDREW JUN 05-08
2 H BONNIE JUN 23-28
3 H CHARLEY AUG 13-20
4 T DANIELLE SEP 07-10
5 H EARL SEP 10-18
6 H FRANCES NOV 18-21
Tropical depression stage
Tropical storm stage
Hurricane stage
Extratropical stage
Subtropical depression stage
Subtropical storm stage
Position and date at 0000 GMT
Position at 1200 GMT
Lowest central pressure in millibars
Initial position of system "Number 6"
H HURRICANE
T TROPICAL STORM
ST SUBTROPICAL STORM
BONNIE
ANDREW
CHARLEY
EARL
FRANCES
DANIELLE
990 mb
1000 mb
979 mb
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 40°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500

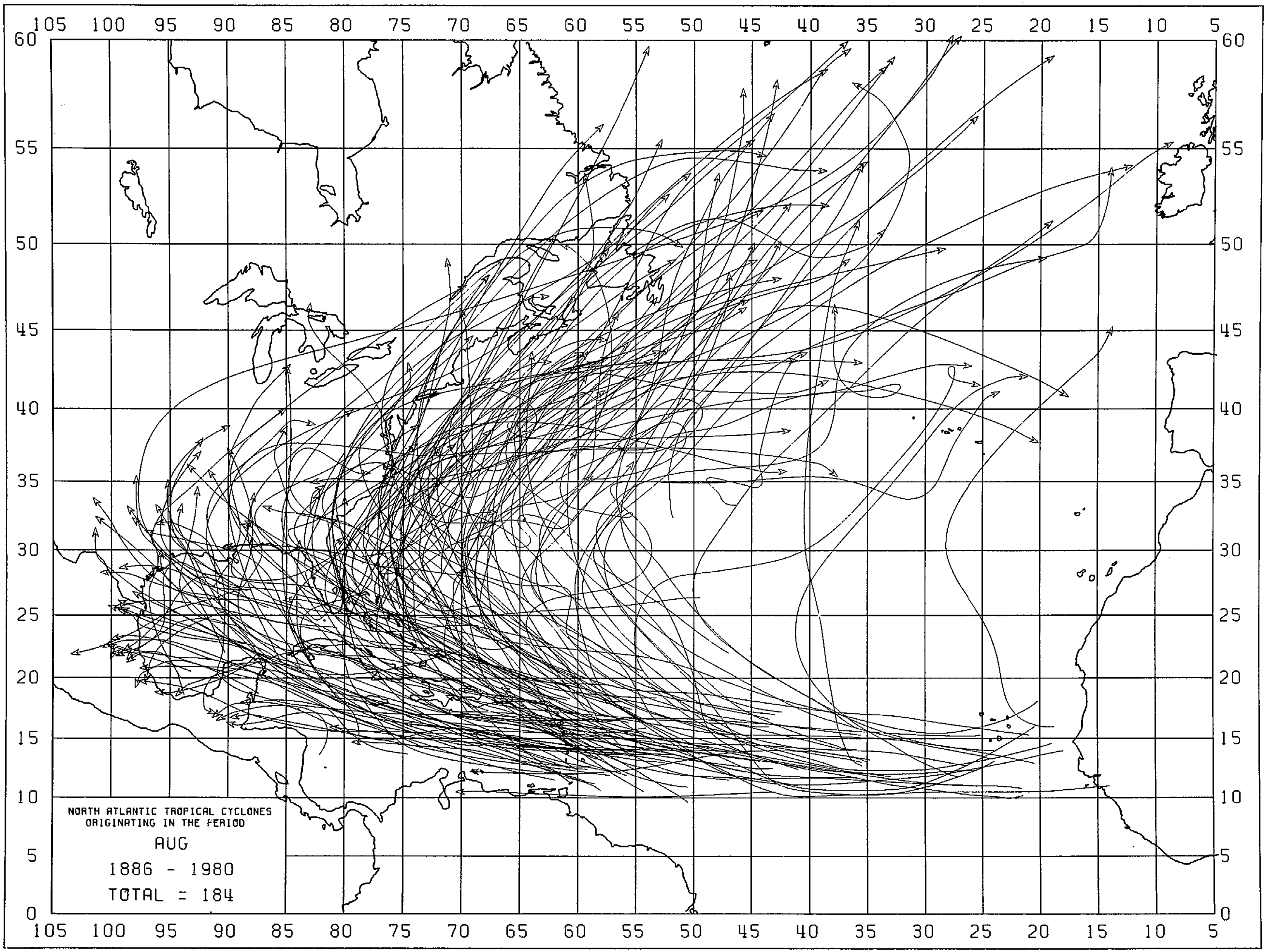


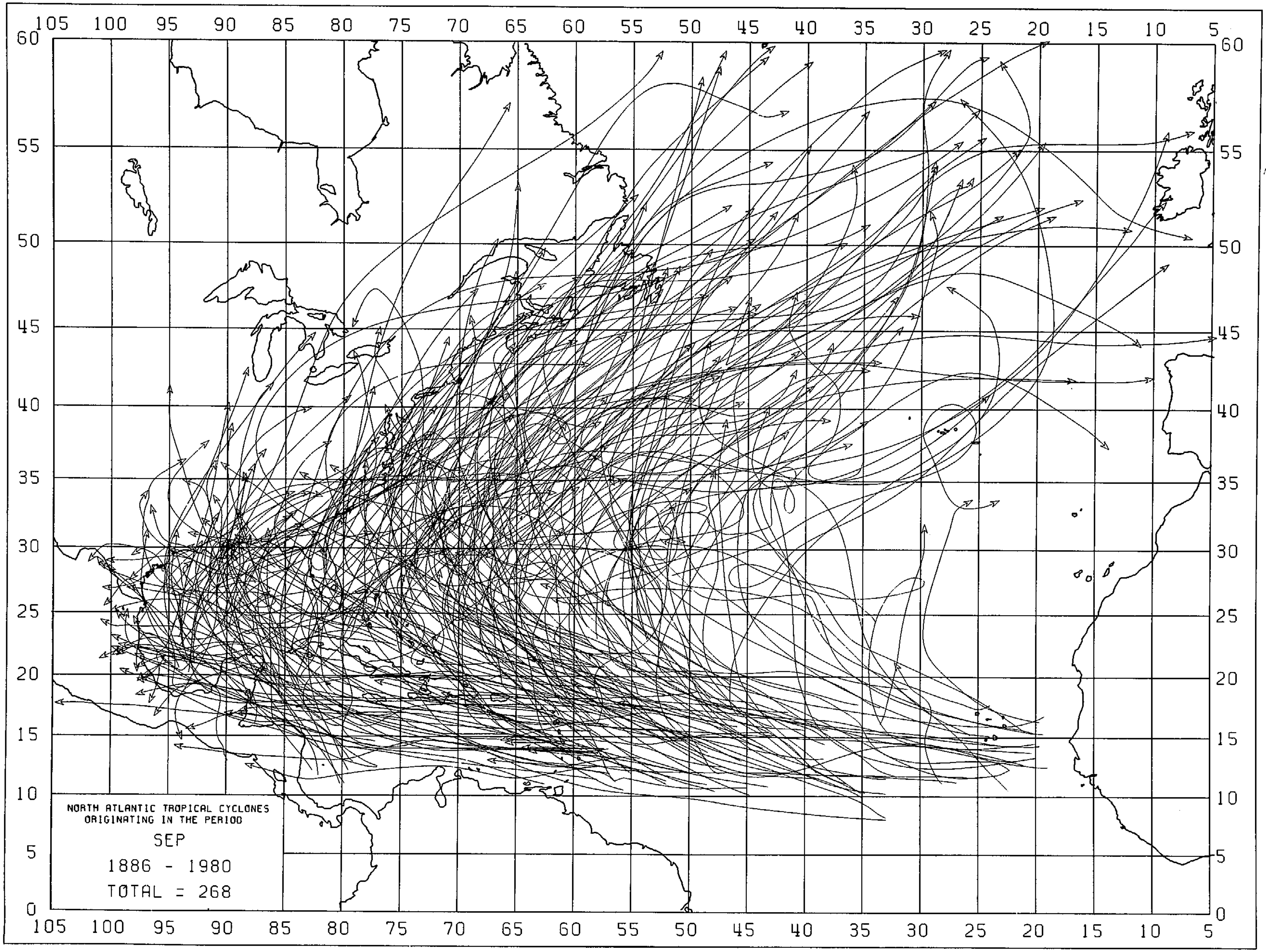
NATIONAL HURRICANE CENTER
ATLANTIC · CARIBBEAN · GULF OF MEXICO · HURRICANE TRACK CHART
1985
NUMBER TYPE NAME DATE
1 T ANA JUL 15-19
2 H BOB JUL 21-26
3 H CLAUDETTE AUG 09-17
4 H DANNY AUG 12-20
5 H ELENA AUG 28-SEP4
6 T FABIAN SEP 15-19
7 H GLORIA SEP 16-OCT 2
8 T HENRI SEP 21-25
9 T ISABEL OCT 07-15
10 H JUAN OCT 26-NOV 1
11 H KATE NOV 15-23
Tropical depression stage
Tropical storm stage
Hurricane stage
Extratropical stage
Subtropical depression stage
Subtropical storm stage
Position and date at 0000 GMT
Position at 1200 GMT
989 mb Lowest central pressure in millibars
6 Initial position of cyclone number 6
H HURRICANE
T TROPICAL STORM
ST SUBTROPICAL STORM
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 100 200 300 400 500
WEST ◦ EAST

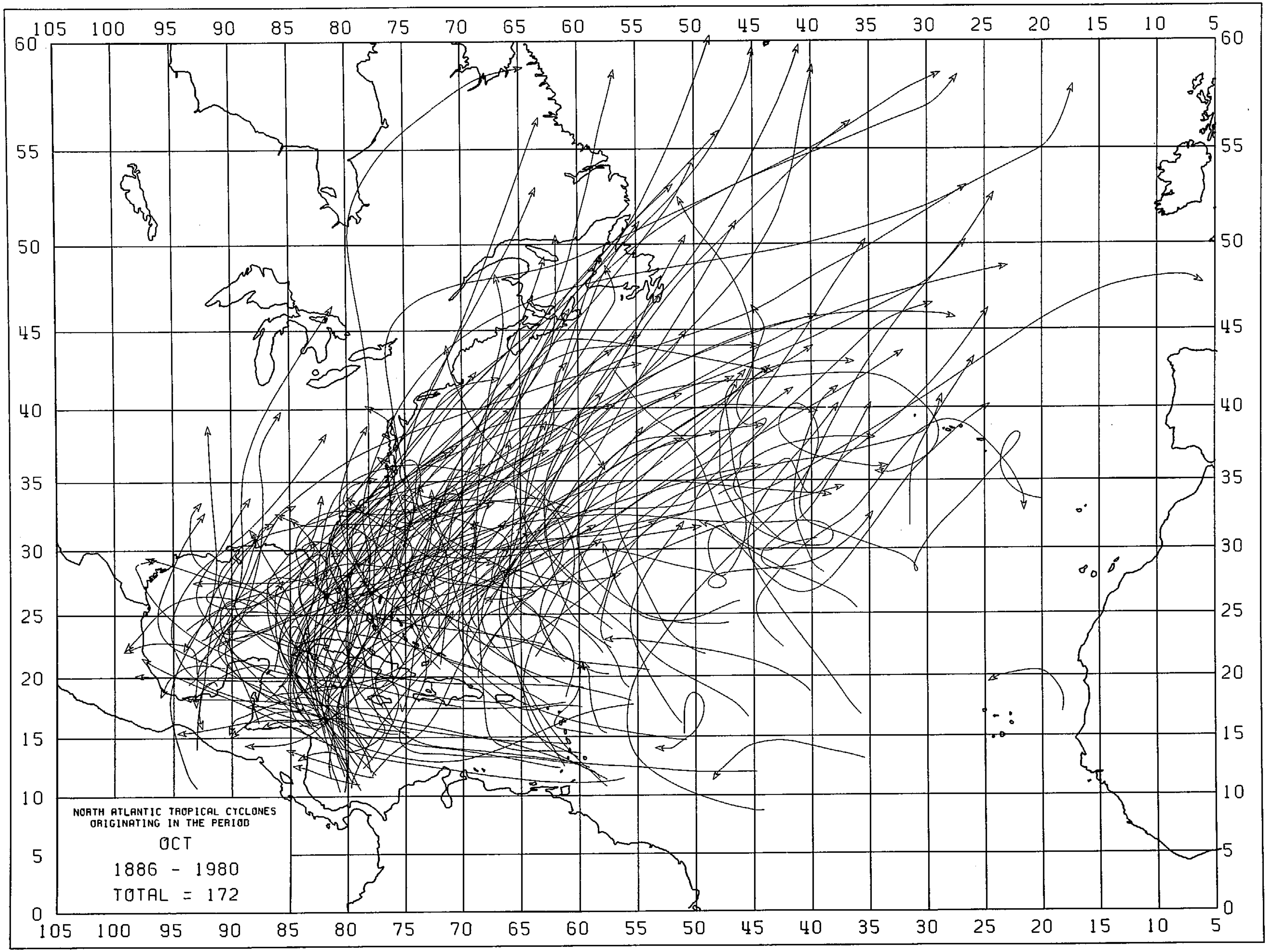

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
MAY
1886 - 1980
TOTAL = 13

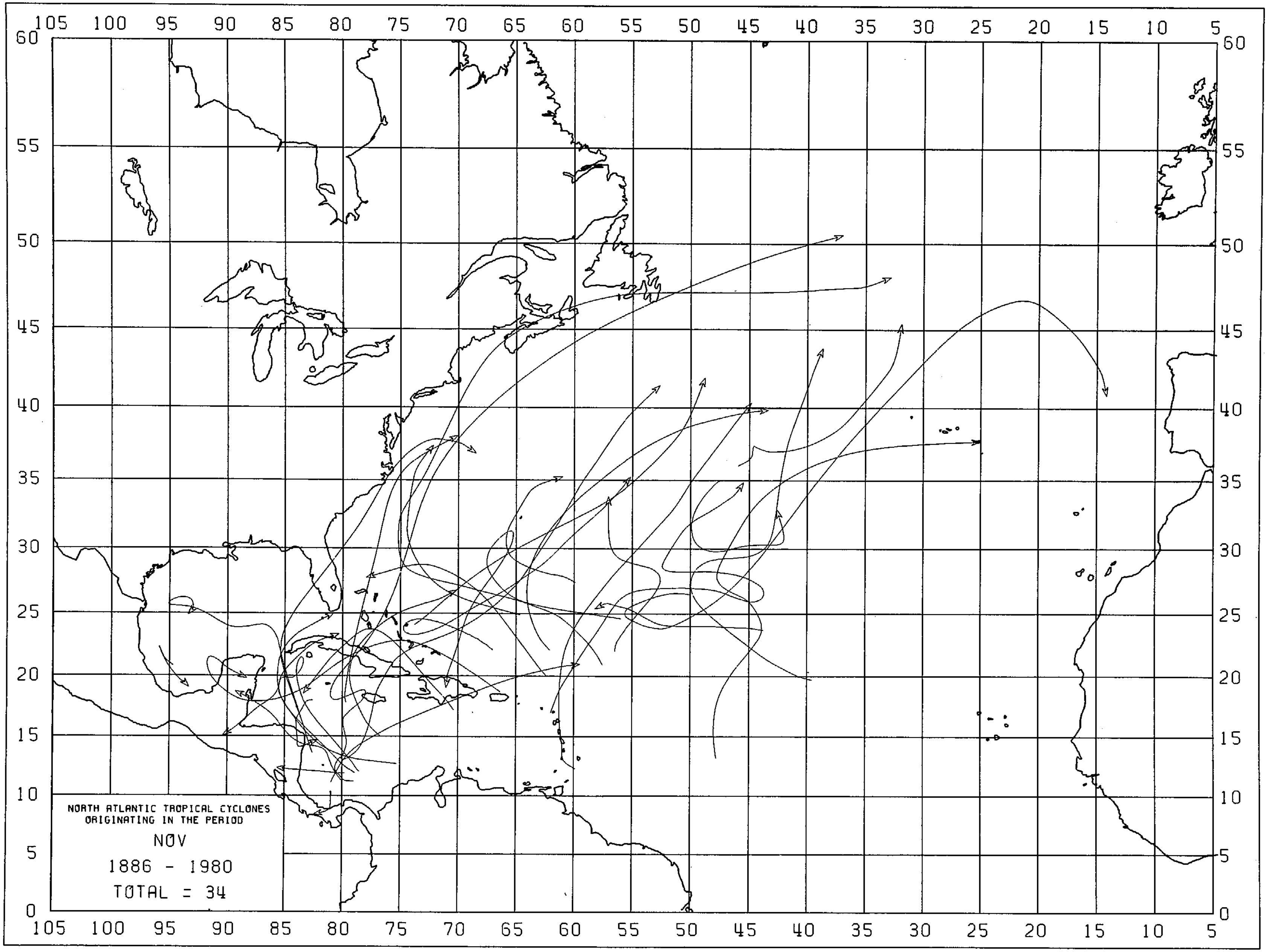

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUN
1886 - 1980
TOTAL = 50


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUL
1886 - 1980
TOTAL = 64

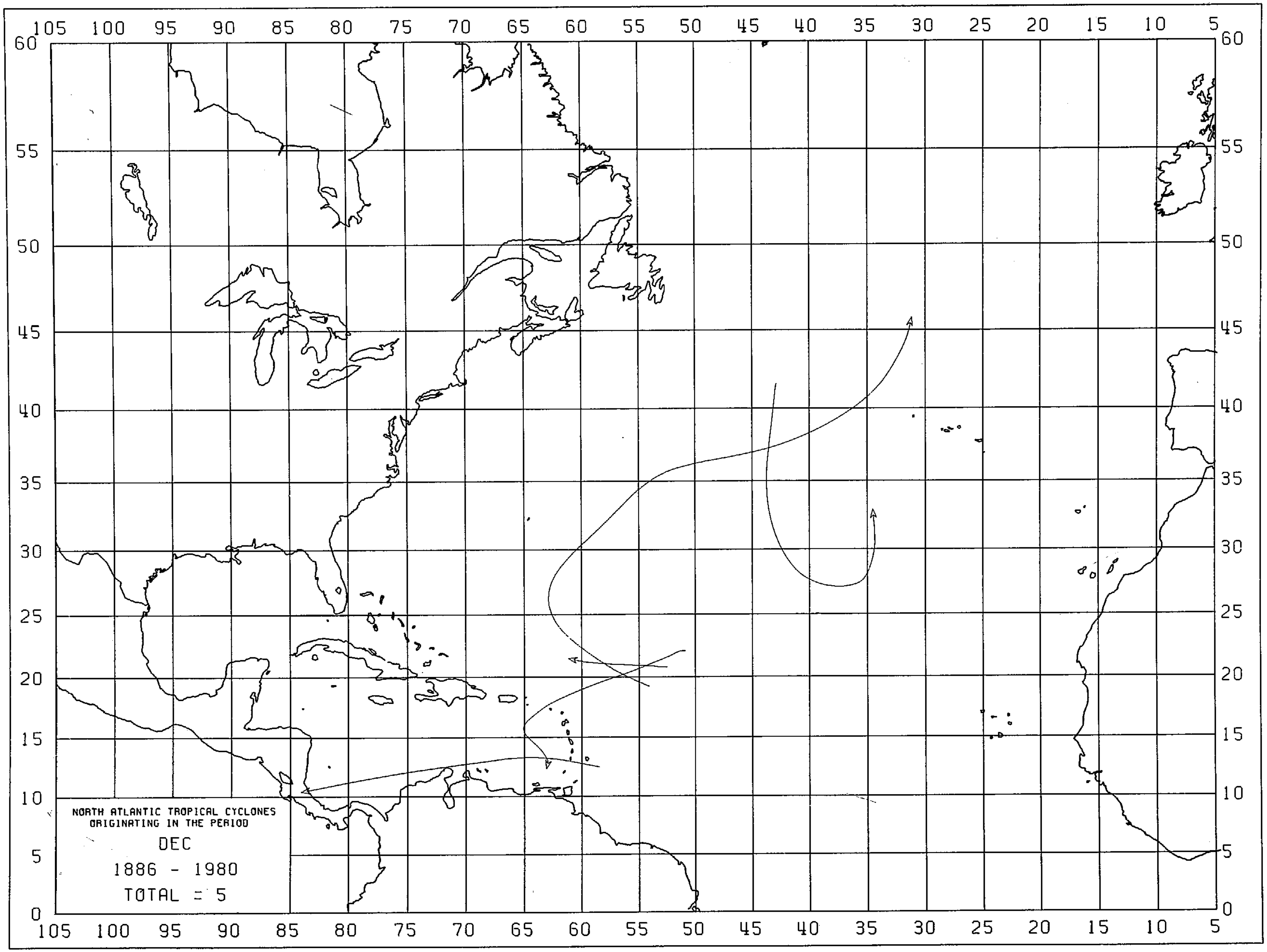

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
AUG
1886 - 1980
TOTAL = 184
105 100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
60 55 50 45 40 35 30 25 20 15 10 5 0

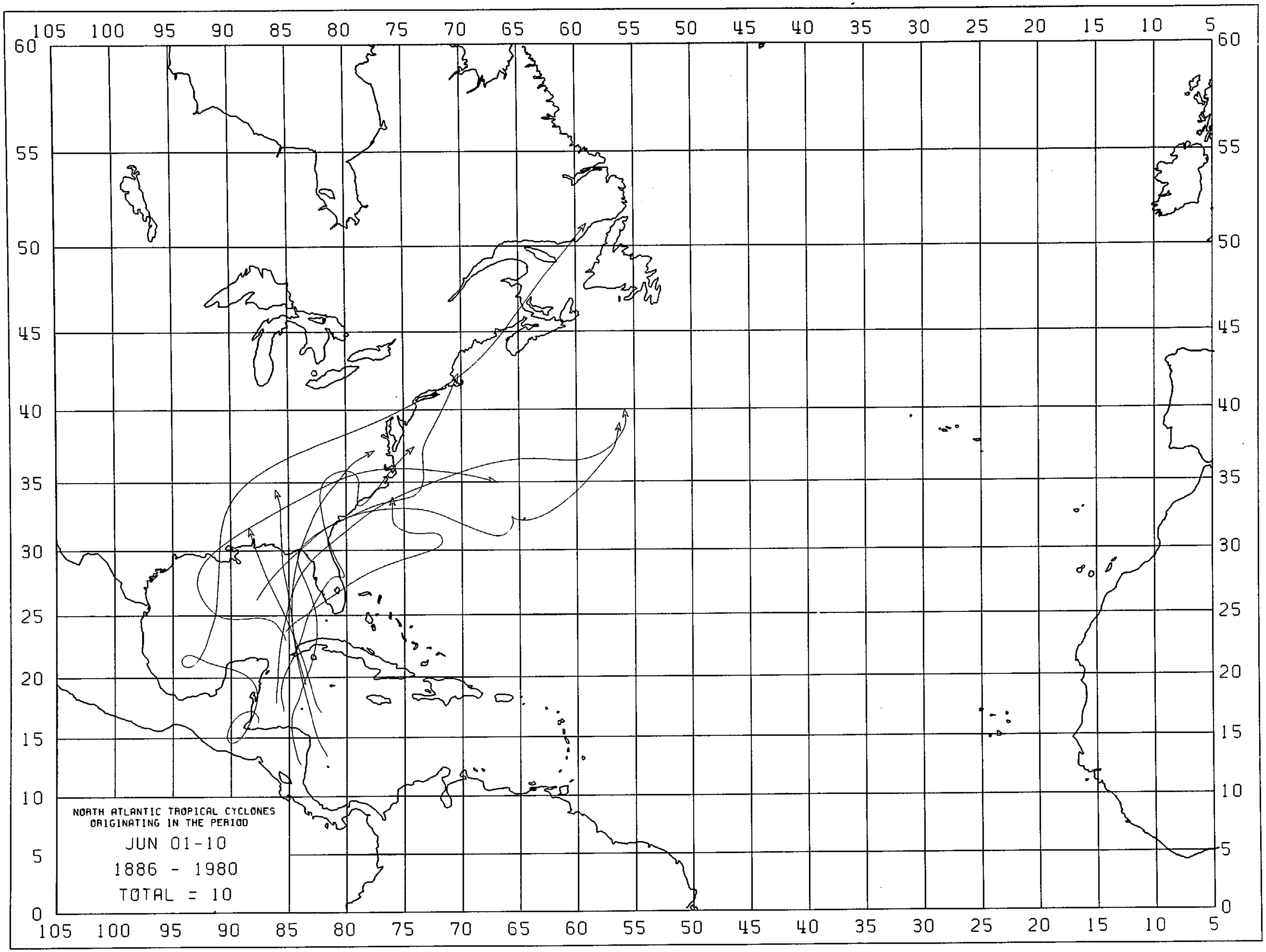

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
SEP
1886 - 1980
TOTAL = 268
105 100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
60 55 50 45 40 35 30 25 20 15 10 5 0

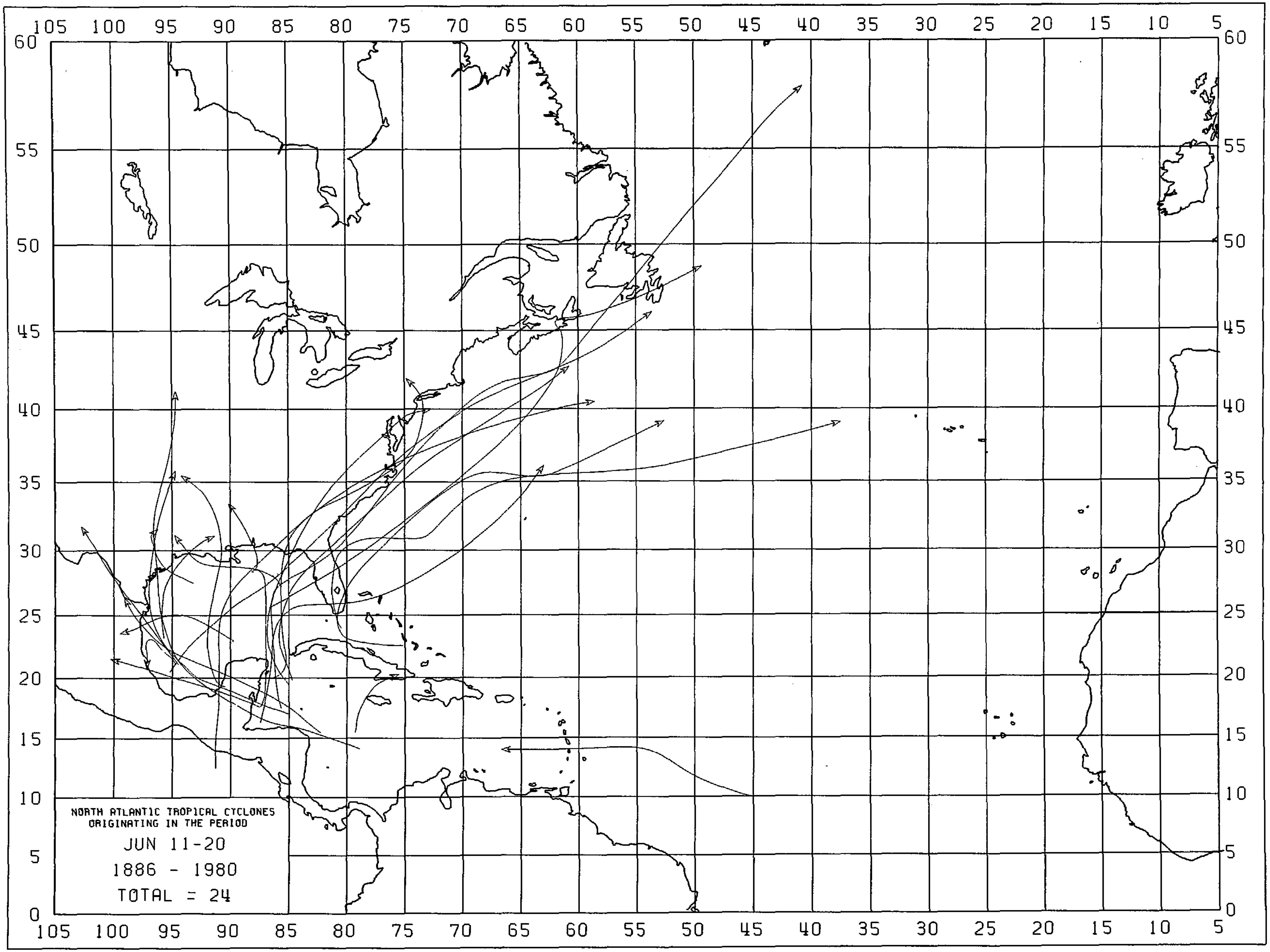

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
OCT
1886 - 1980
TOTAL = 172

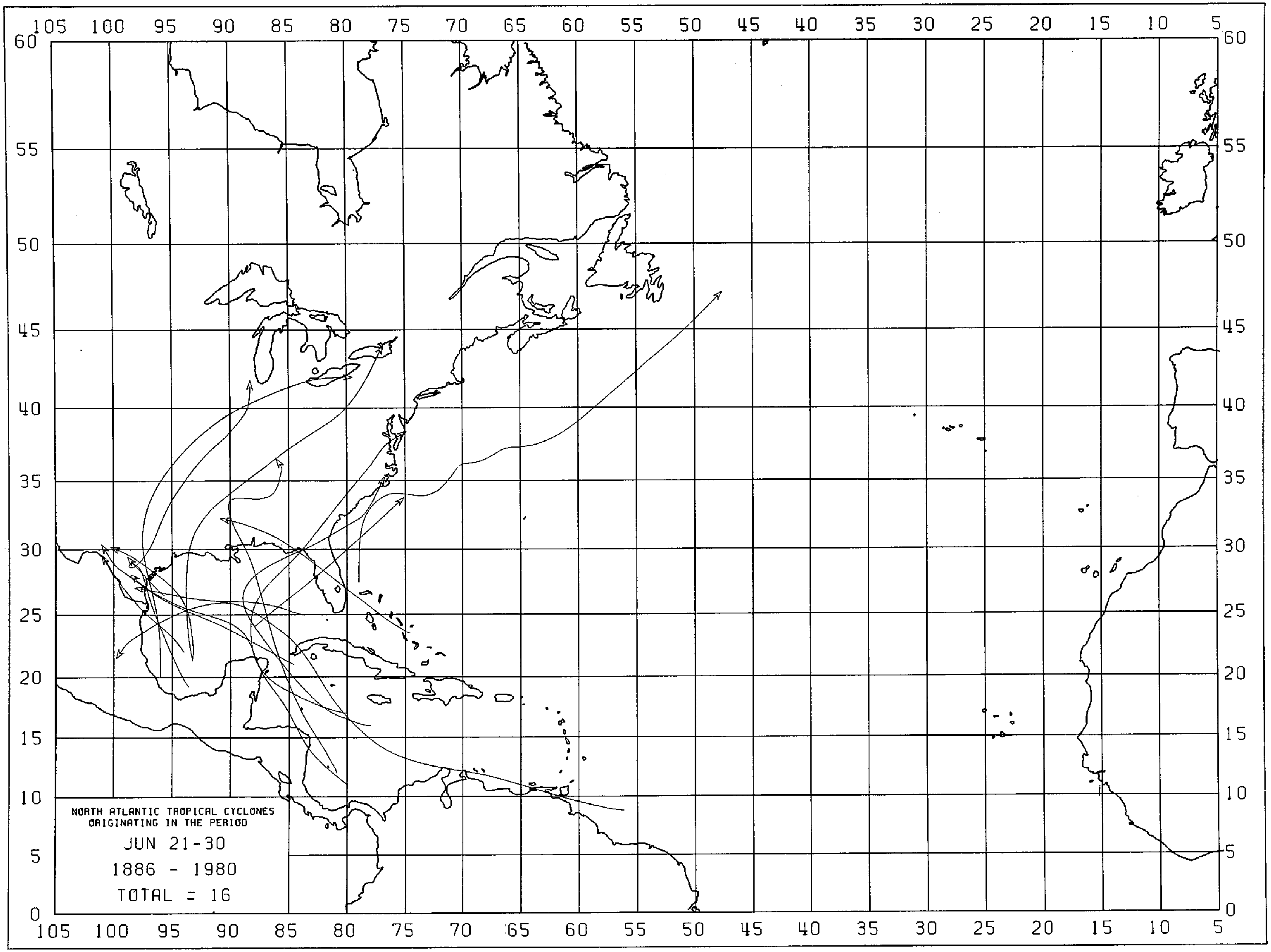


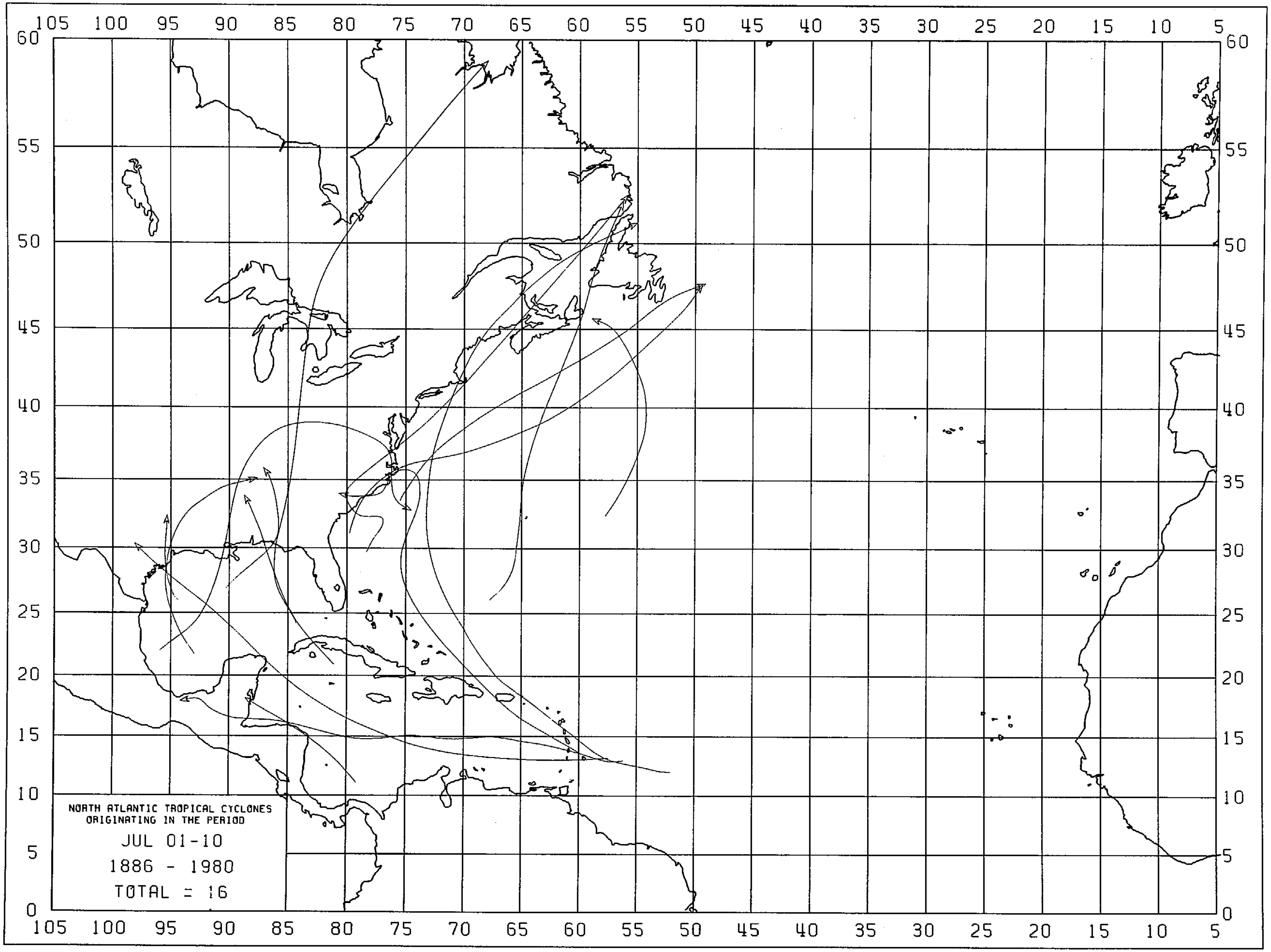
NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
NOV
1886 - 1980
TOTAL = 34


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
DEC
1886 - 1980
TOTAL = 5

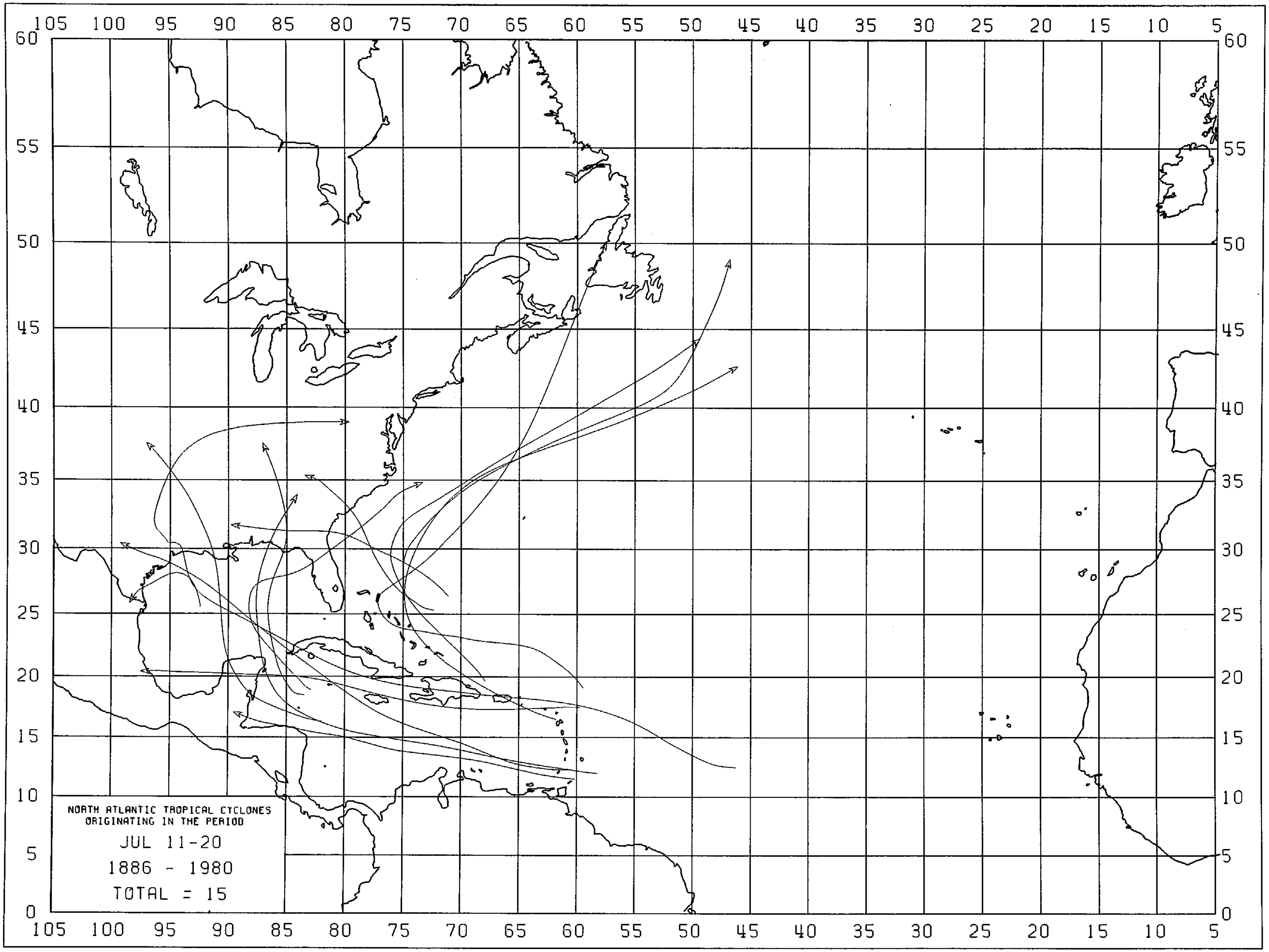

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUN 01-10
1886 - 1980
TOTAL = 10

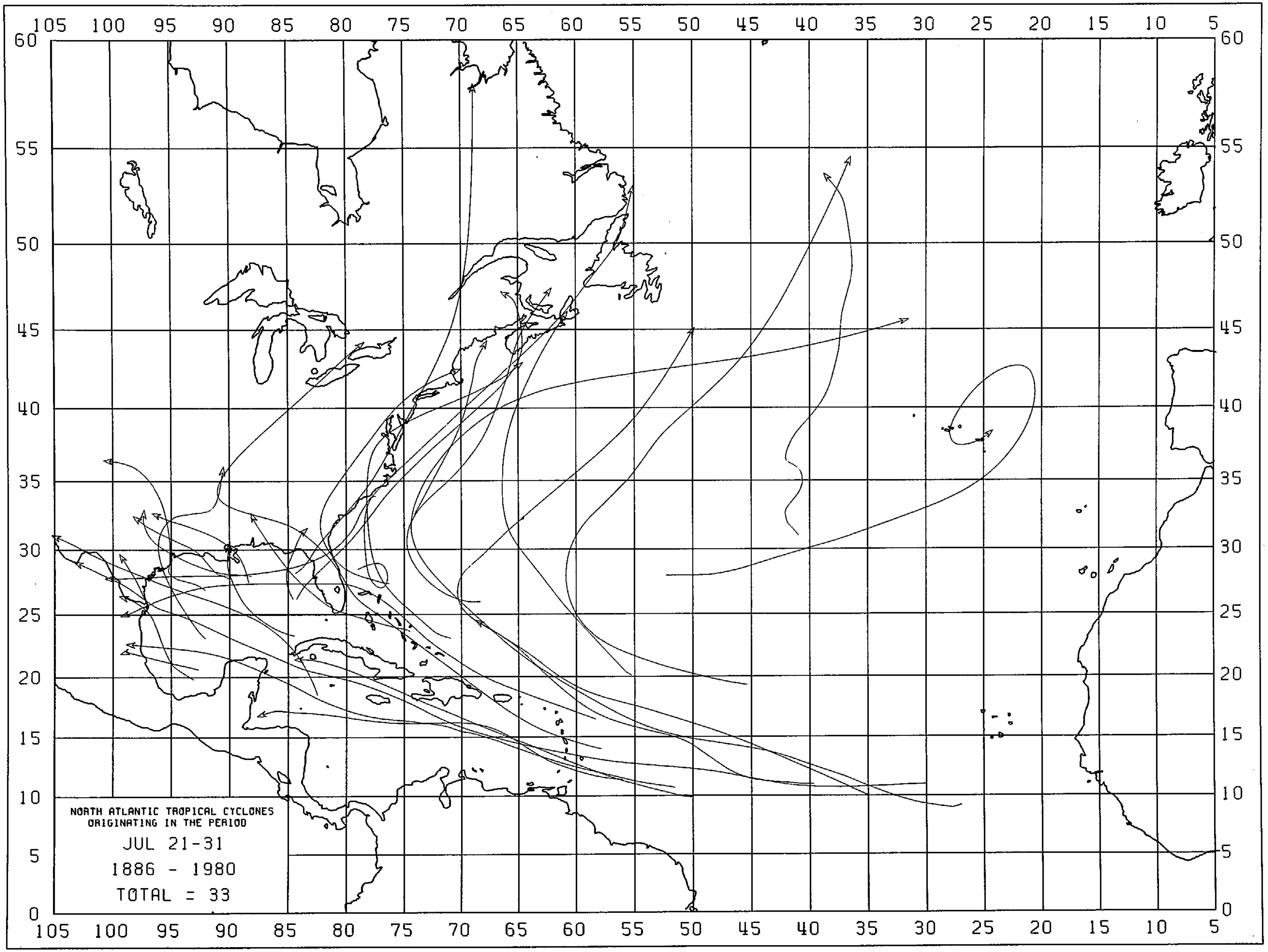

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUN 11-20
1886 - 1980
TOTAL = 24


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUN 21-30
1886 - 1980
TOTAL = 16

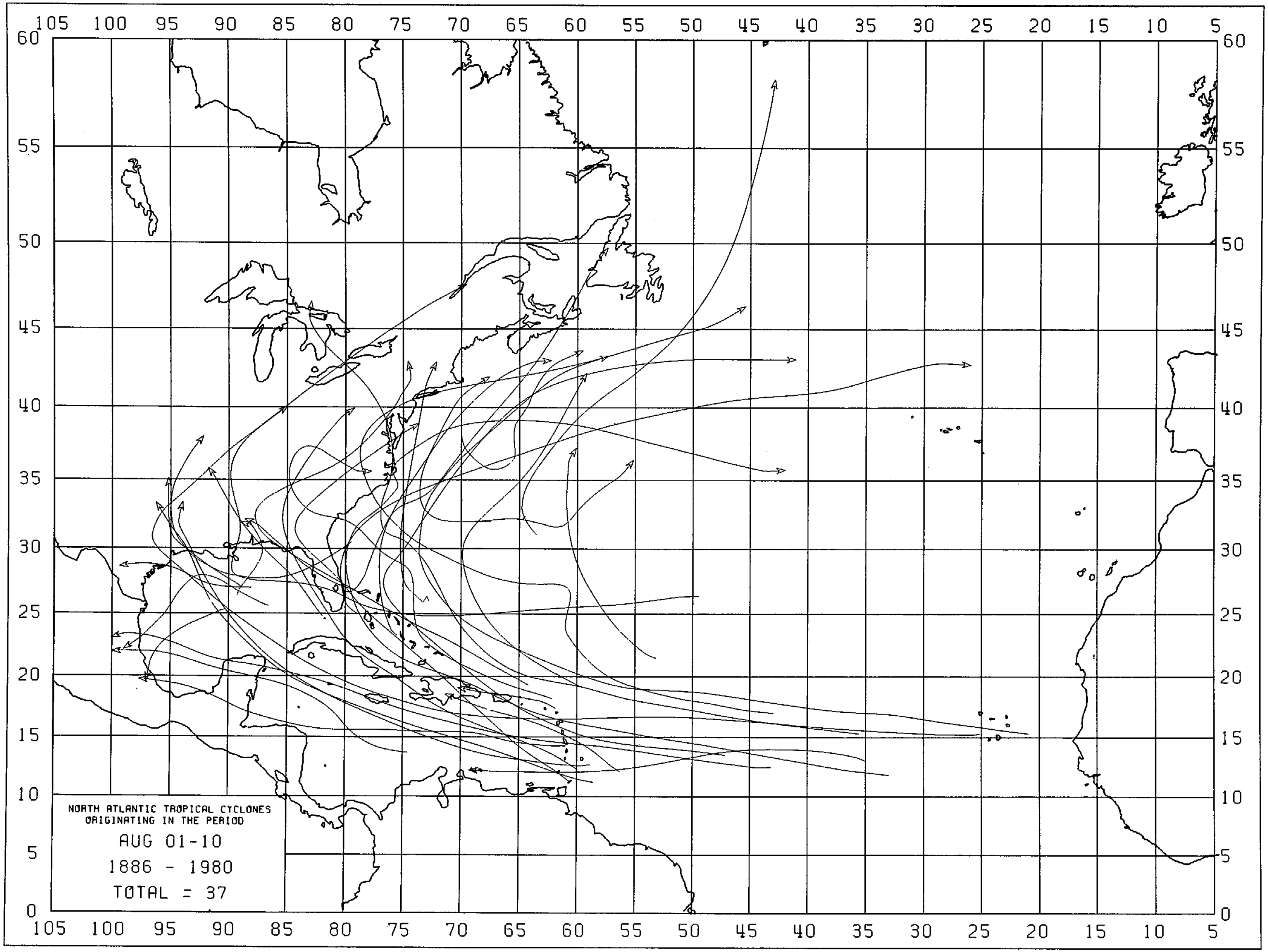


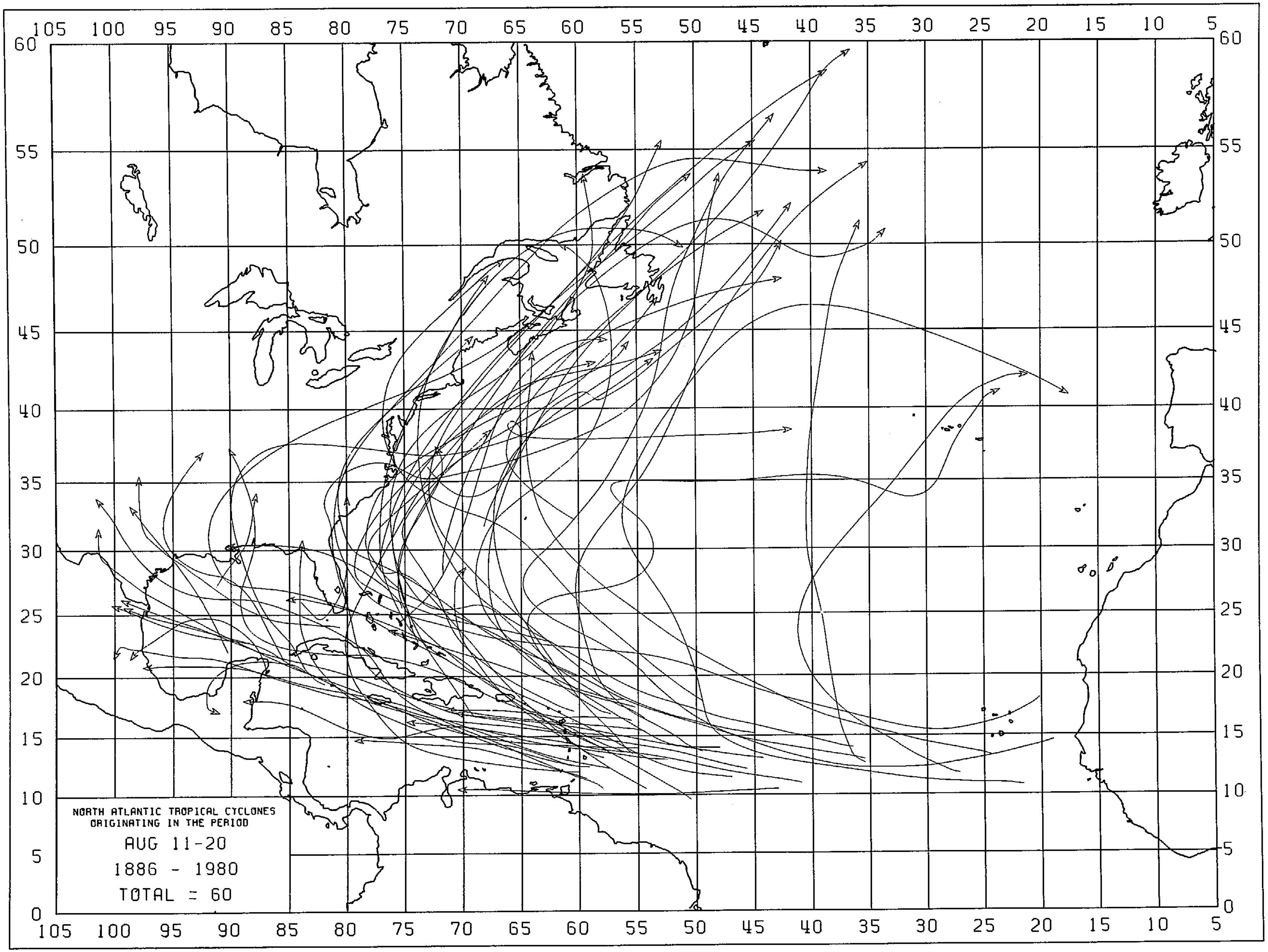
NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUL 01-10
1886 - 1980
TOTAL = 16

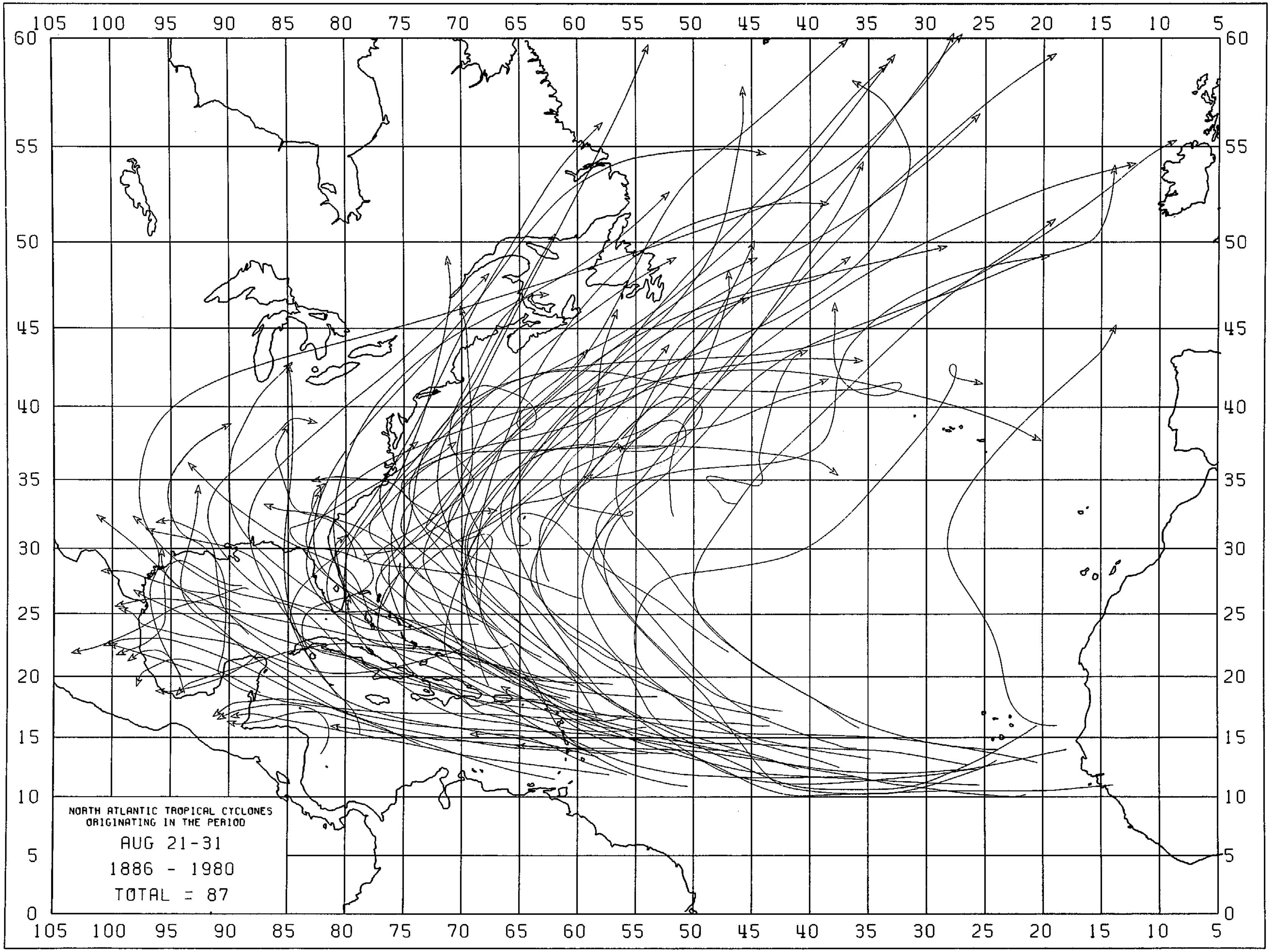

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUL 11-20
1886 - 1980
TOTAL = 15

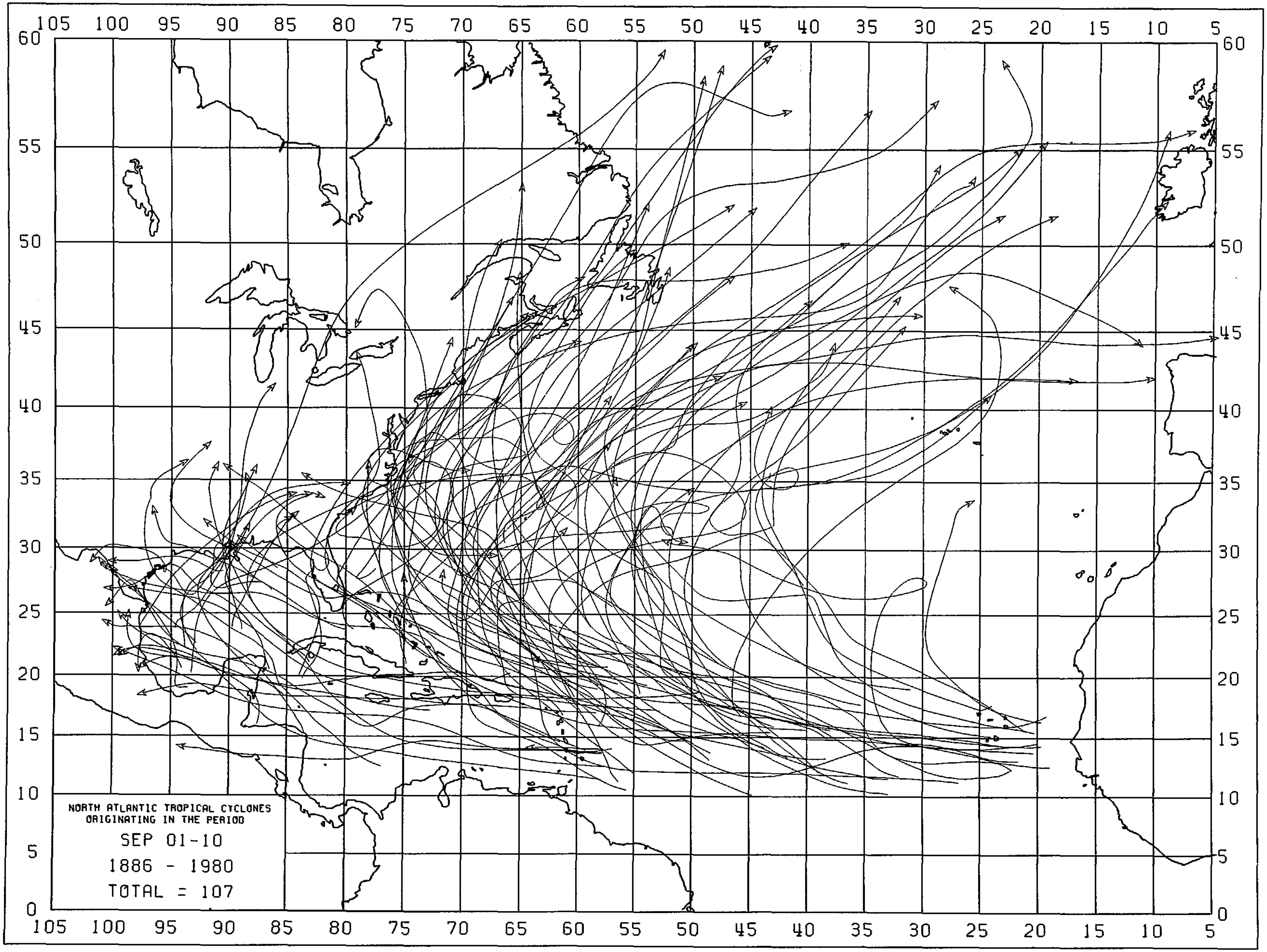


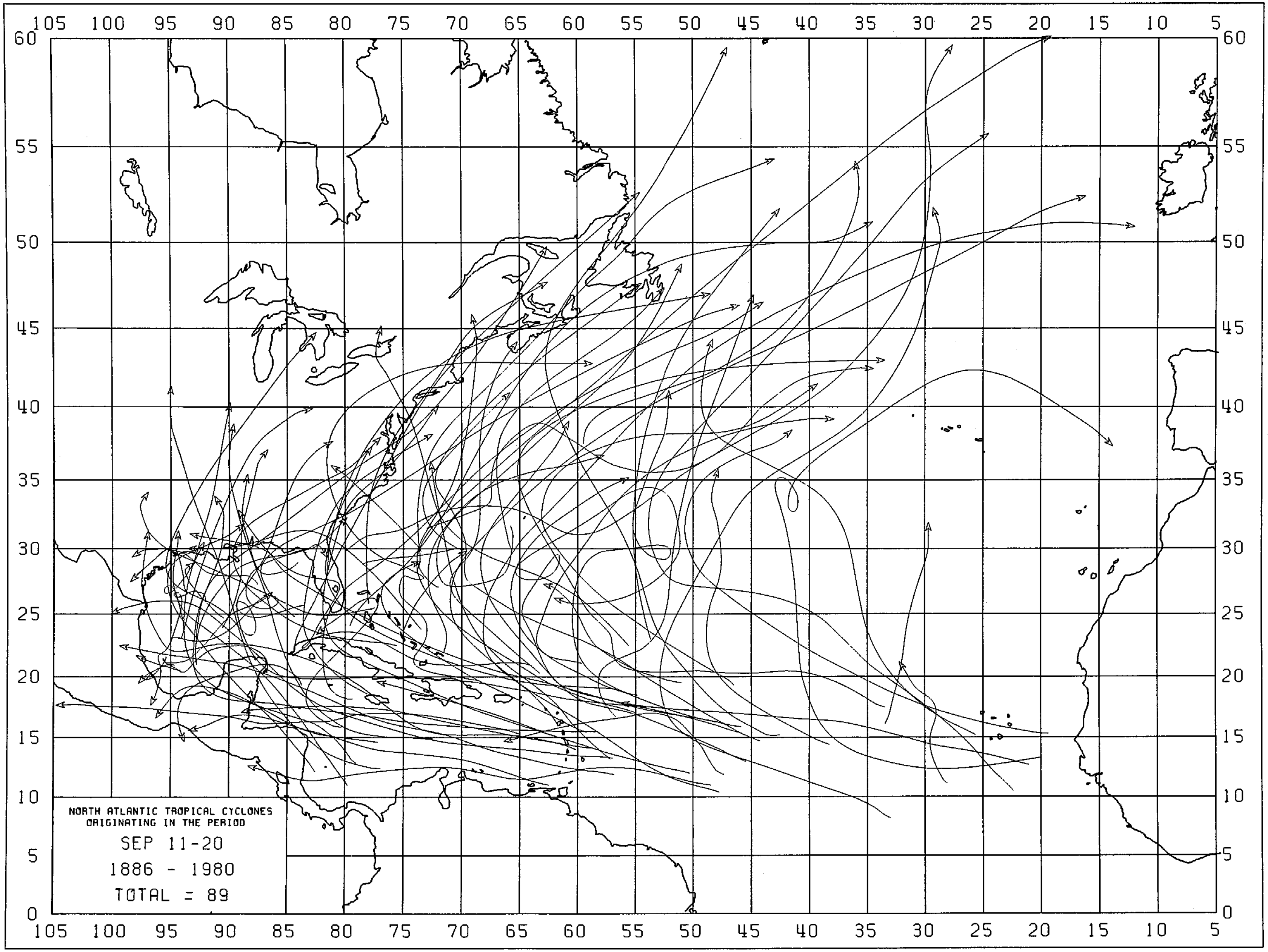
NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
JUL 21-31
1886 - 1980
TOTAL = 33
105 100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
0 5 10 15 20 25 30 35 40 45 50 55 60

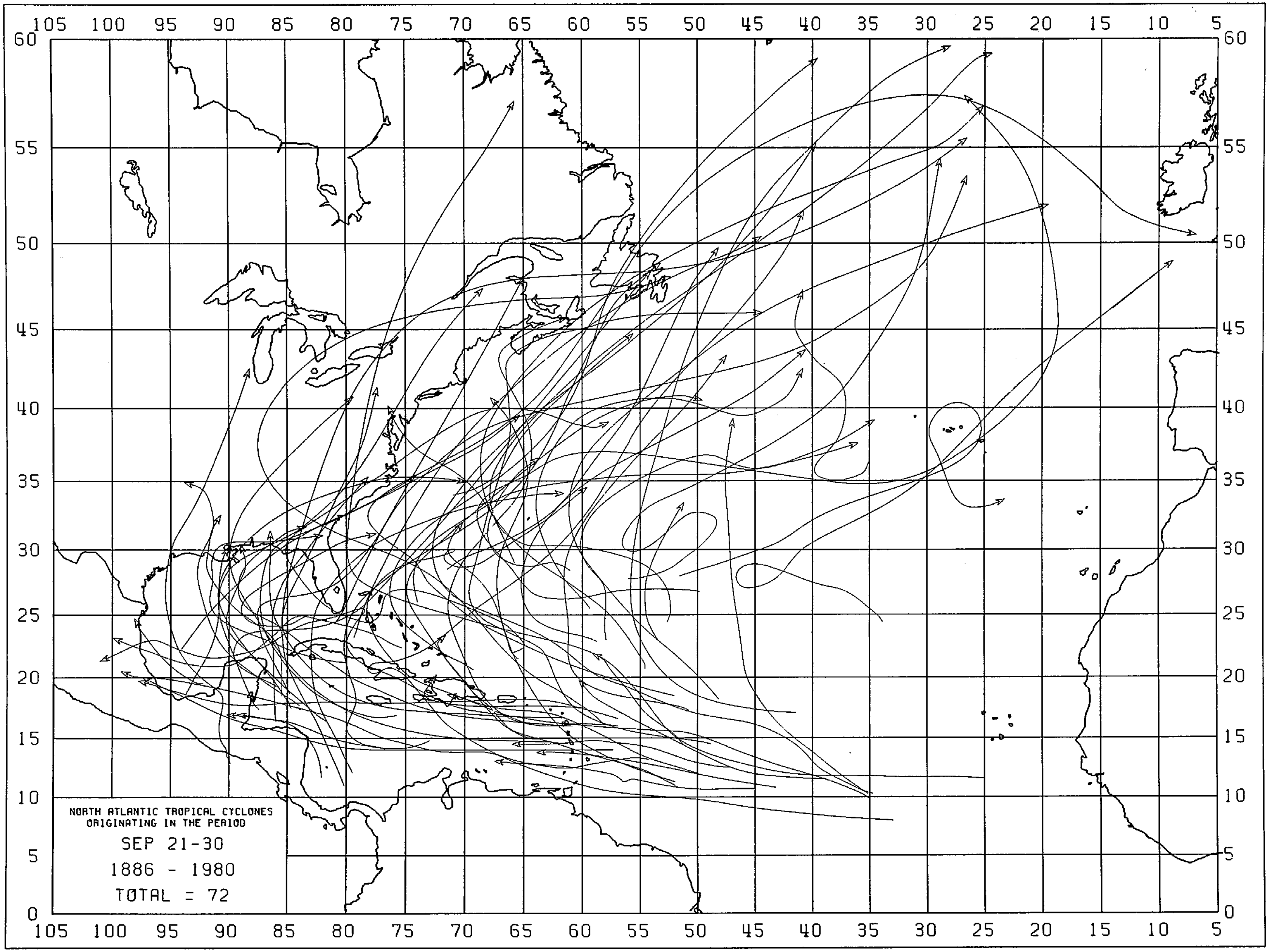

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
AUG 01-10
1886 - 1980
TOTAL = 37

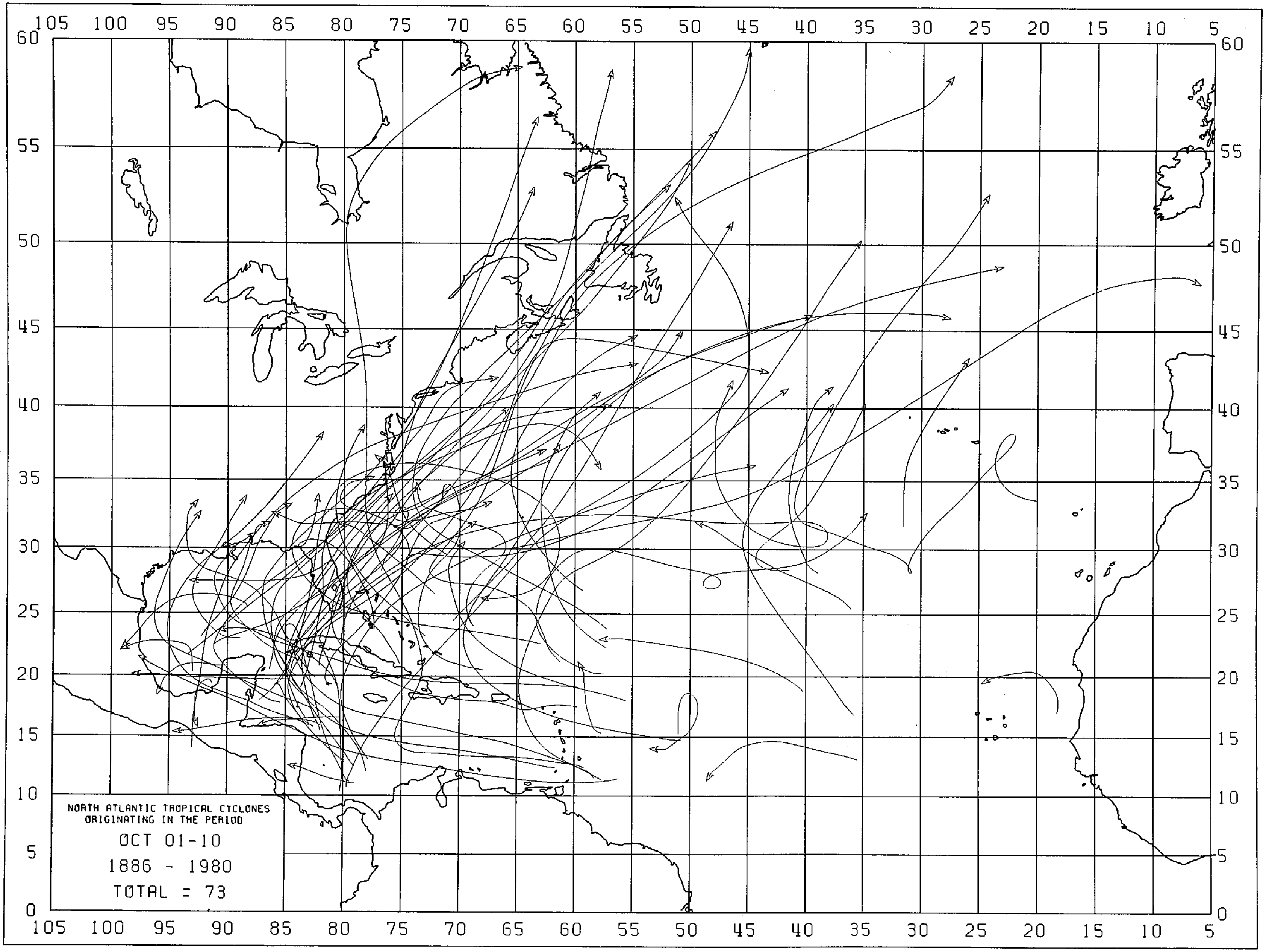

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
AUG 11-20
1886 - 1980
TOTAL = 60

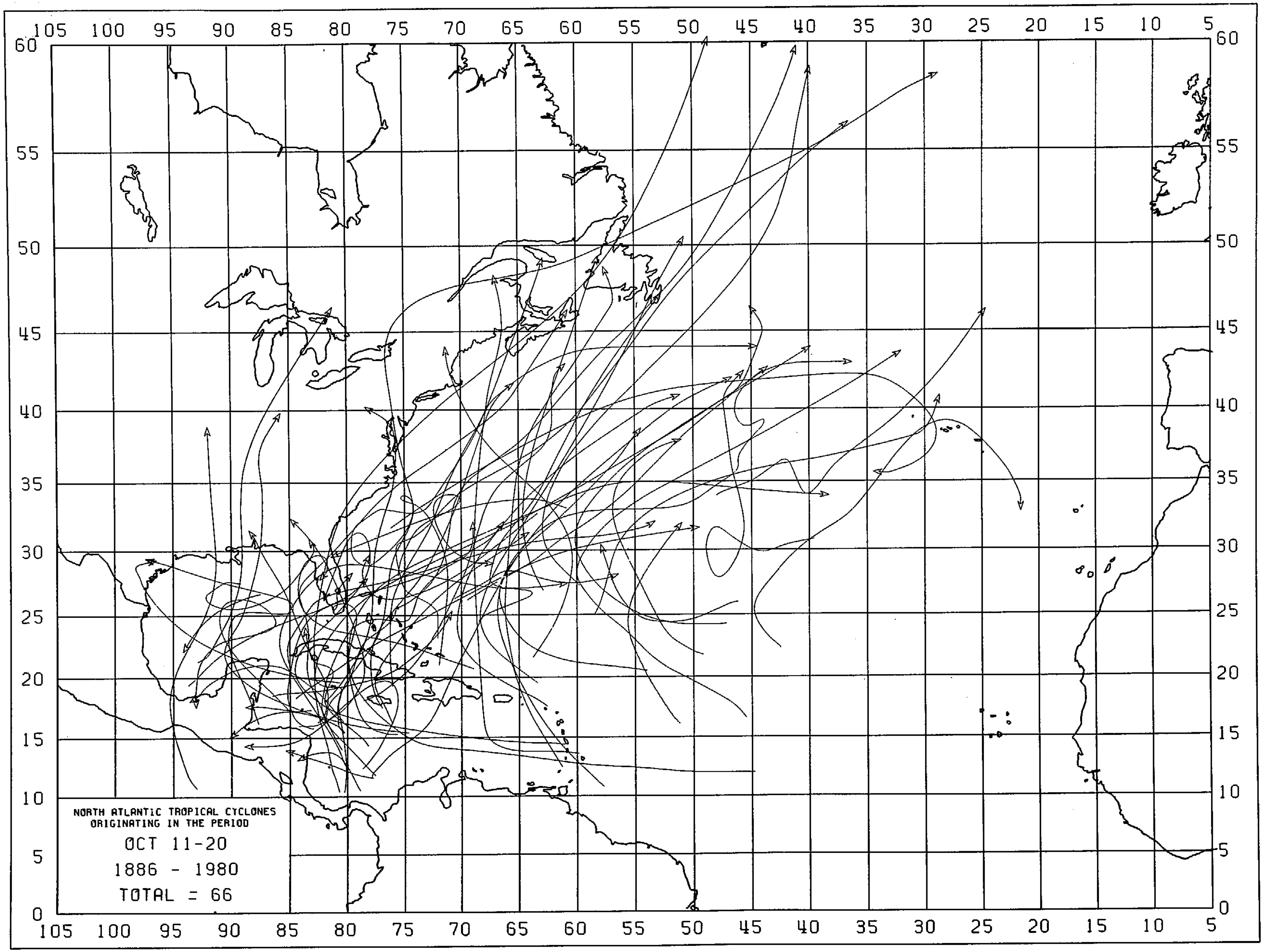

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
AUG 21-31
1886 - 1980
TOTAL = 87

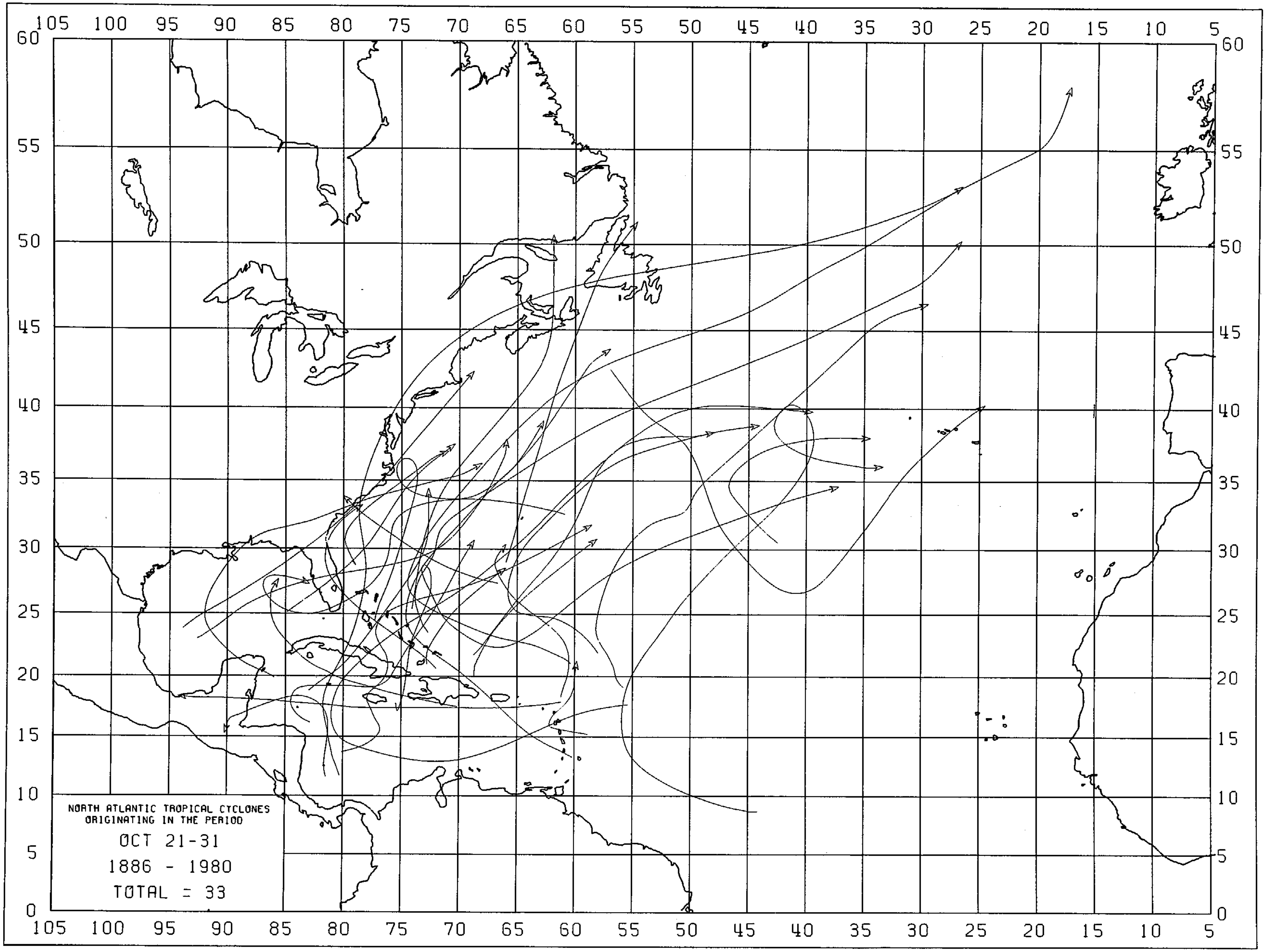

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
SEP 01-10
1886 - 1980
TOTAL = 107

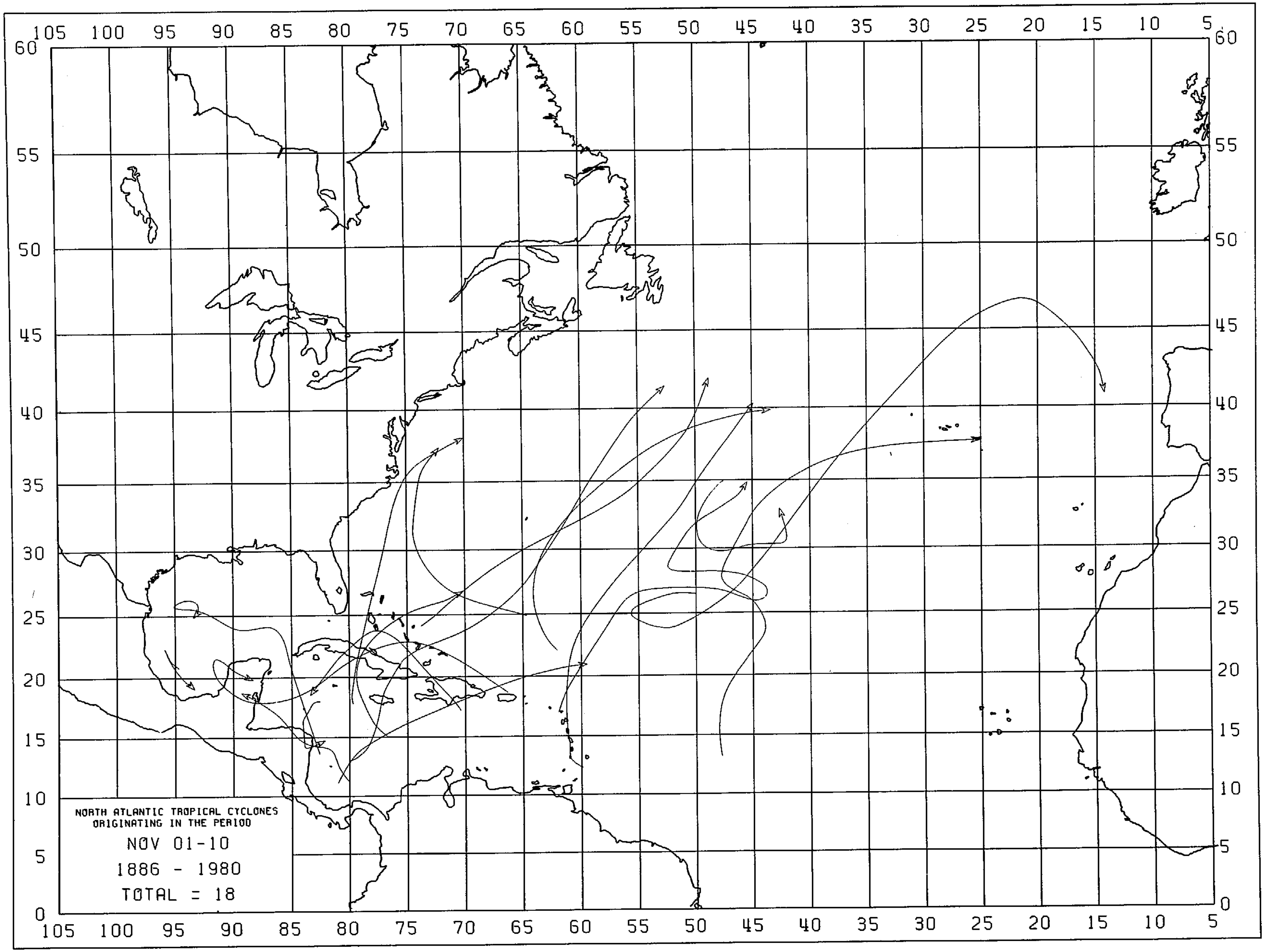

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
SEP 11-20
1886 - 1980
TOTAL = 89
105 100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
60 55 50 45 40 35 30 25 20 15 10 5 0

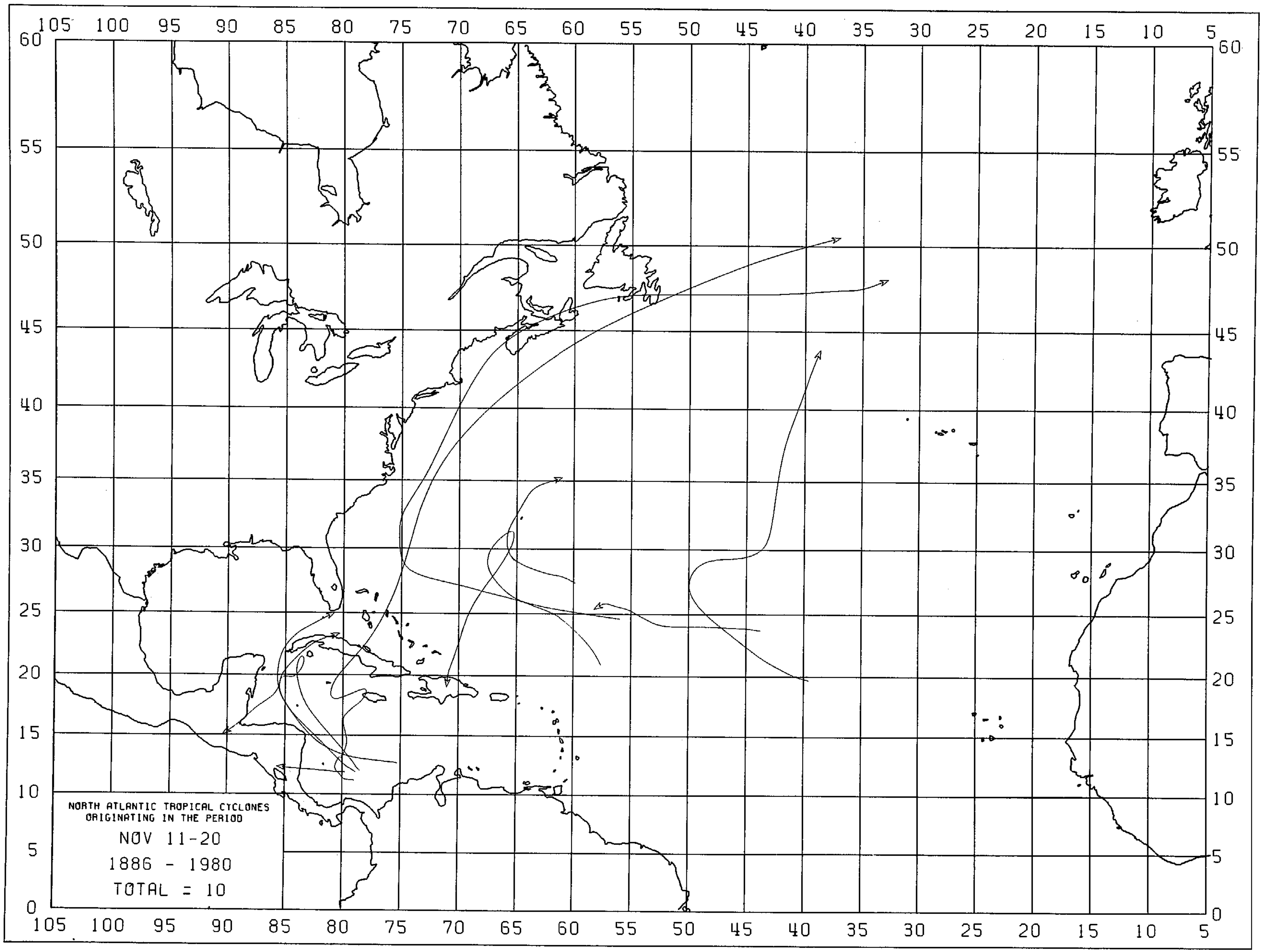

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
SEP 21-30
1886 - 1980
TOTAL = 72

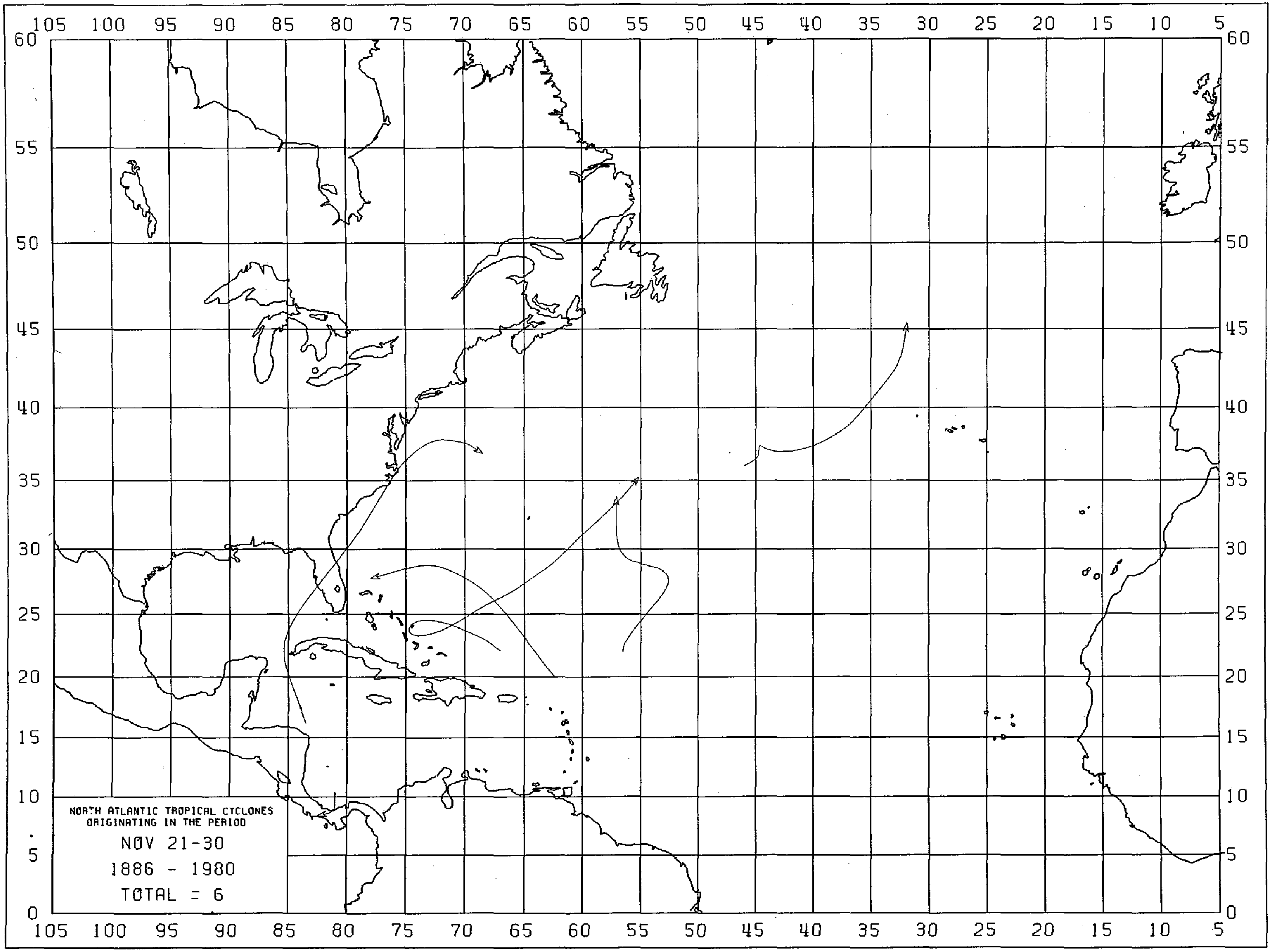

NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
OCT 01-10
1886 - 1980
TOTAL = 73


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
OCT 11-20
1886 - 1980
TOTAL = 66


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
OCT 21-31
1886 - 1980
TOTAL = 33


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
NOV 01-10
1886 - 1980
TOTAL = 18


NORTH ATLANTIC TROPICAL CYCLONES
ORIGINATING IN THE PERIOD
NOV 11-20
1886 - 1980
TOTAL = 10



USCOMM-NOAA-ASHEVILLE, N.C. 7/85/650